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DUGWAY, UTAH

RANGE REFERENCE ATMOSPHERE
0-30 KM ALTITUDE

JUNE 1983

METEOROLOGY GROUP
RANGE COMMANDERS COUNCIL

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KWAJALEIN MISSILE RANGE
YUMA PROVING GROUND

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FOREWORD

Atmospheric parameters are essential to the research and development of issiles and aerospace vehicles. In the early 1960's, the need was recognized r realistic atmospheric models derived in a consistent manner for each of the eral major test ranges. An atmospheric model derived from statistical data a particular geographical location is referred to as a reference atmosphere.

The first Range Reference Atmosphere (RRA) was issued in 1963 by the inter-Range Instrumentation Group (IRIG) for Cape Kennedy, Florida, and was ollowed by additional publications for several ranges up to 1974. Since that time, improved upper air data bases have become available from which to velop the RRA. These resulted from the extended period of records and from provement in the upper air measuring program by rocketsondes for altitudes ove the rawinsonde ceiling of 30 km. Revised and improved RRAs are justi- for the following reasons:

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2) Most ranges now have an extended and improved upper air data base which to develop a more definitive RRA.

There are requirements for RRAs for new ranges and range sites.

There have been scientific advances in understanding the upper spheric structure and physical relationships.

Advances in statistical modeling techniques have been made because general availability of high-speed electronic computers. These have the adoption of advanced concepts in atmospheric modeling.

For these reasons, the Range Reference Atmosphere Committee (RRAC) was by the Range Commanders Council Meteorology Group (RCC MG) to estab- new and improved RRAs. The purpose, scope, and objectives of this task outlined in the following paragraphs.

Purpose: This committee, Task MG-1, establishes RRAs for the several nges as provided by the RCC. An RRA is a model of the Earth's atmosphere a geographical location of interest, for use by DOD and other U.S. overnment range users. The RRA is used to provide planning data for eval- ating environmental constraints for the particular configurations of vironment-sensitive systems and components being developed or undergoing

Scope: Using the best available upper atmosphere data base to include awinsonde, rocketsonde and possibly other high-altitude data sources for range location. the task is to establish a model of certain statistics wind and thermodynamic quantities derived in a uniform manner and pub- in a standardized format.

Objectives: The wind statistics shall be, insofar as practical, modeled to be consistent with rigorous mathematical probability properties of the multivariate normal probability theory. The thermodynamic quantities statistics shall be, insofar as practical, modeled to be consistent with the hydrostatic equation, the equation of state, and the probability principles that are related through these physical equations. The document shall serve as an authoritative source of information and as an atmospheric model for a particular range. The first in the series of revised RRAs to be published is for Kwajalein Missile Range (KMR) (publication date December 1982). The altitude range required for KMR is 0 to 70 km. The order of priority for the subsequent publications is:

	Range	Altitude Range Required
1.	AFFTC/Edwards AFB, CA	0 - 70 km[a]
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6.	UTTR/Dugway (Michael AAF), UT	0 - 30 km[b]
7.	AD/Eglin AFB, FL	0 - 30 km
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9.	NASA/Wallops Flight Center, VA	0 - 70 km
10.	Taquac (Guam)	0 - 30 km
11.	PMTC/Barking Sands, HI	0 - 70 km

In keeping with the RCC's objective of standardization, the modeling techniques, basic text, and tabulation format are to be the same for all RRAs. These new and revised RRAs present not only the mean values of the thermodynamic quantities (pressure, temperature, virtual temperature, and density), but also include statistical measures for the dispersion (i.e., standard deviations and skewness coefficients). New quantities presented are water vapor pressure and dewpoint temperature. The statistical modeling for the wind is entirely new. The new approach uses the properties of the bivariate normal probability distribution function.

a. Use rocketsonde data from PMTC/Point Mugu for altitudes above 30 km.
b. Consider augmenting data base from Ely or Salt Lake City.

All final computations were performed by the United States Air Force Environmental Technical Applications Center (USAFETAC) in response to a task from Eastern Space and Missile Center (ESMC).

The text was prepared jointly by USAFETAC and the NASA/George C. Marshall Space Flight Center's Space Sciences Laboratory, Atmospheric Sciences Division. The editing and preparation of the draft manuscript were performed by the NASA/MSFC organization.

The cochairmen express their gratitude to all RRAC members and their respective colleagues who have made significant technical contributions to the establishment of these RRAs.

Special thanks are tendered to Lt. B. Novograd for his dilligence in forming the many computations and the development of the primary tables, I through IV. Special thanks goes to Lt. F. Wirsing for editing and formulating the equations for the derivable thermodynamic equations. These gentlemen performed this outstanding work under the direction of Major B. Lilius, USAFETAC.

Grateful acknowledgment goes to Mrs. Annette Tingle, NASA/MSFC, for editing the draft manuscript.

The RRAC consists of representatives from the U.S. Air Force, U.S. Army, National Aeronautics and Space Administration, U.S. Navy, and National Oceanic and Atmospheric Administration. The committee members for the RRA for the first publication are:

G. G. Boire, WSMC
G. H. Daniel, ESMC
. de Violini, PMTC
. G. Finger, NOAA/NWS
E. E. Fisher, HQ AFS
B. R. Hixon, PMTC
J. M. Hobbie, KMR
E. J. Keppel, A
S. F. Kubinski, WSMR
F. J. Schmidlin, NASA/WFC

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DUGWAY, UTAH

RANGE REFERENCE ATMOSPHERE
0-30 KM ALTITUDE

June 1983

Prepared by

Range Reference Atmosphere Committee
Meteorology Group
Range Commanders Council

Published by

Secretariat
Range Commanders Council
White Sands Missile Range, New Mexico 88002

TABLE OF CONTENTS

A

LIST OF ORGANIZATION ACRONYMS

AD	Armament Division
AFFTC	Air Force Flight Test Center
AFSC	Air Force Systems Command
AFSC/AFGL	AFSC/Air Force Geophysics Laboratory
AFSC/SD	AFSC/Space Division
AFSCF	Air Force Satellite Control Facility
AFTFWC	Air Force Tactical Fighter Weapons Center
AWS	Air Weather Service
BMD	Ballistic Missile Division
DOD	Department of Defense
DOE	Department of Energy
DOE/NTS	DOE/Nevada Test Site
DPG	Dugway Proving Ground
ESMC	Eastern Space and Missile Center
ETR	Eastern Test Range
KMR	Kwajalein Missile Range
NASA	National Aeronautics and Space Administration
NASA/MSFC	NASA/Marshall Space Flight Center
NASA/WFC	NASA/Wallops Flight Center
NOAA	National Oceanic and Atmospheric Administration
NWC	Naval Weapons Center
PMTC	Pacific Missile Test Center
USA/DTC	U.S. Army/Deseret Test Center
USAECOM	U.S. Army Electronics Command
USAFETAC	United States Air Force Environmental Technical Applications Center

FOREWORD

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O. E. Smith	Maj. B. W. Galusha
Cochairman, NASA/MSFC	Cochairman, USAF/ETAC

CHAPTER I. INTRODUCTION

A. Definition and Purpose of the Range Reference Atmosphere

A.1 Definition

A reference atmosphere is a statistical model of the Earth's atmosphere derived from upper air measurements over a particular geographical location. Hence, these Range Reference Atmospheres (RRAs) are atmospheric models developed by the Range Reference Atmosphere Committee (RRAC) in response to a task by the Range Commanders Council Meteorology Group (RCC MG) and published by the RCC Secretariat. The RCC MG, formerly called the Inter-Range Instrumentation Group/Meteorology Working Group (IRIG/MWG), published a series of RRAs during the period 1963 through 1974.

A.2 Purpose

A series of revised and expanded RRAs are to be published for locations of interest to the RCC. These publications are to serve as authoritative reference sources on certain upper air statistics and as atmospheric models for particular range sites. The technical usefulness of these documents for the ranges, range users, U.S. aerospace industries, and the scientific community is recognized because of the standardization of the development techniques and the presentation of the tabulations.

B. Scope of the Range Reference Atmosphere and Arrangement of Tables

B.1 Scope

The RRA contains tabulations for monthly and annual means, standard deviations, and skewness coefficients for windspeed, pressure, temperature, density, water vapor pressure, virtual temperature, and dewpoint temperature; the means and standard deviations for the zonal (U) and meridional (V) wind components; and the linear (product moment) correlation coefficient between the wind components. These statistical parameters are tabulated at the station elevation, at 1-km intervals from sea level to 30 km, and at 2-km intervals from 30 to 90 km. The wind statistics are given at approximately 10 m above the station elevations and at altitudes with respect to mean sea level thereafter. For those range sites without rocketsonde measurements, the RRAs terminate at 30 km altitude, or they are extended, if required, when rocketsonde data from a nearby launch site are available. There are four sets of tables for each of the 12 monthly reference periods and the annual reference period.

B.2 Arrangement of Tables

The statistical parameters for the RRA models are presented in four tables, as outlined in the following paragraphs.

Table I contains all the wind statistical parameters. This table gives the monthly and annual means and standard deviations of the U and V wind components and the linear (product moment) correlation coefficient between these

two components, the mean, standard deviation and skewness coefficient of the windspeed; and the number of wind observations (sample size).

Table II contains the monthly and annual means, standard deviations, and skewness values of pressure, temperature, and density, and the number of observations used for each of these thermodynamic quantities.

Table III contains the monthly and annual means, standard deviations and skewness values of the water vapor pressure, virtual temperature and dewpoint, and the number of observations for each of these moisture-related quantities. The statistical parameters for water vapor pressure and dewpoint terminate at 15 km altitude. Above 15 km the statistical parameters for virtual temperature are considered to be the same as those for temperature.

Table IV contains the monthly and annual mean atmospheric models for the thermodynamic variables: pressure, virtual temperature, and density. This table is derived from the monthly and annual mean virtual temperature versus altitude (geometric) using the hydrostatic equation and the equation of state. Also presented is the geopotential height corresponding to the tabulated geometric altitudes.

The physical unit for all wind parameters is meters per second. The physical unit for pressure is millibars; for temperature and virtual temperature, degrees Kelvin; for density, grams per cubic meter; and for water vapor pressure, millibars. In all cases the skewness coefficient and the correlation coefficient between wind components are unitless. All reference to altitude is geometric altitude and is expressed in kilometers. All reference to height is geopotential height and has the unit geopotential meters or kilometers. All geometric altitudes and geopotential heights are with respect to mean sea level.

C. Data Quality Control Procedures

A small portion (less than 10 percent) of the soundings in the data base used to calculate the RRA tables contained erroneous data values. The soundings which contained these erroneous values were eliminated from the data base using the following procedures:

1) Soundings containing gaps in their height data greater than 200 mb were rejected. This step was taken because some soundings only contained height values at their "mandatory" pressure levels, which were occasionally missing, resulting in soundings with no height information at all.

2) An initial set of RRA statistics was computed using all the remaining soundings. This initial set of statistics was used to determine data limits for the temperature, pressure, U and V components of the wind, and the dewpoint (for the 0- to 30-km portion of the RRA) or the density (for the 30- to 90-km portion of the RRA). The lower (upper) data limits were set at the mean value for a specific parameter, minus (plus) six standard deviations of that quantity. One pair of data limits was computed for each of these parameters: month of the year and data level.

3) This initial set of data limits was then used to screen the data base. All the soundings that contained values outside these data limits were rejected. A new RRA was then computed using the screened data base. This second RRA was used to generate a second set of data limits.

4) The second set of data limits was then used to screen the data base further. A new RRA was again generated. The skewness values in this RRA were then evaluated, according to empirical criteria specified in section II.A.3 of this document for the winds, and according to criteria in section III.A.3 for the thermodynamic quantities. If these criteria were satisfied, the new RRA was then used to generate a final set of data limits, which were used to control the quality of the data base for the final version of the RRA.

5) Occasionally, the third RRA that was generated did not satisfy all of the skewness criteria. This indicated that some incorrect values were still present in the data base. To complete quality control, steps 3 and 4 were repeated for additional iterations (usually one or two) until the resulting RRA satisfied the skewness criteria. At that point, a final set of data limits was generated. This final set of data limits was then used to control the quality of the data base and generate the final RRA.

D. Organization of the Chapters

Because there are plans to publish a series of RRAs, comments on the special organization of the document are in order. The RRA document is arranged in four chapters. Chapter I is the introduction. Chapter II, Wind Statistics and Models, contains the techniques used to arrive at the wind statistical parameters, table I, and the probability functions that are to be used as wind models to derive several wind statistics. Chapter III, Statistics of Thermodynamic Quantities and Models, contains the techniques used to arrive at the thermodynamic and moisture-related statistical parameters given in tables II and III and the atmospheric thermodynamic model presented in table IV. This chapter also contains sets of equations to calculate several atmospheric properties. Chapter IV contains the general conclusions and recommendations. These four chapters are reprinted without change for each documented RRA to assure consistency and for expediency in preparing the documentation. To account for variations particular to a specific RRA, two appendixes have been included. Appendix A, Examples of Wind Statistics, is designed to give a few illustrative examples of wind statistics for the specific RRA and cursory observations, comparisons, or comments on wind statistics. Appendix B, Range Specific Information, is designed to present specific information particular to the range, such as geographical location, data base, etc., and any cursory observations or comments on the thermodynamic quantities.

Read these appendixes! They are located as the last two units in the document because they may vary in length depending on the circumstances. Appendixes A and B and tables I, II, III, and IV are the only differences among the RRA documents published in this new RRA series.

CHAPTER II. WIND STATISTICS AND MODELS

A. General Considerations

A.1. Objectives

An objective of the RRA is to furnish minimum tabulation for the wind statistics. To meet this objective, the bivariate normal probability distribution was adopted as a statistical model for the wind treated as a vector quantity at the RRA data levels. Only five statistical parameters are required to completely describe this probability function. In Cartesian coordinates these parameters are the means and standard deviations of the two orthogonal components and the correlation coefficient between the two components. These five statistical parameters for the U and V (meteorological coordinates) components are given in table I. The statistical properties of the bivariate normal probability distribution are used to derive many wind statistics that are of interest to the ranges and range users. This procedure produces consistent wind statistics that are connected through rigorous mathematical probability functions. By using these functions, extensive tabulations of wind statistics are avoided.

The statistical properties of the bivariate normal probability distribution presented for the vector wind statistical model are:

1) The wind components are univariate normally distributed.

2) The conditional distribution of one component given a value of the other component is univariate normally distributed.

3) The windspeed is of the form of a generalized Rayleigh distribution.

4) The frequency distribution of wind direction can be derived.

5) The conditional distribution of windspeed given a value of wind direction (wind rose) can be derived.

6) The five tabulated wind statistical parameters with respect to the meteorological U and V coordinate system can be derived for any arbitrary rotation of the orthogonal axes.

The probability distribution functions and sets of equations to derive wind statistics for the previously stated properties of the vector wind model are presented in this chapter. Symbols used are summarized in table A. Illustrative examples are presented in appendix A. No attempt is made to give the derivation of the probability functions. The reader is referred to Smith (1976) for some derivations and several applications of the probability distribution properties for wind statistics.

A.2. Data Quality Control

The U and V components of the wind were used to generate data limits set at plus and minus six standard deviations from the mean for each of the

TABLE A. LIST OF SYMBOLS USED IN CHAPTER II

N - The number of wind measurements in table I

r - A general variable for the bivariate normal probability distribution in polar coordinates

R - A generalized Rayleigh variable used for derived windspeed probability distribution

R (U, V) - The linear (product moment) correlation coefficient between the zonal and meridional wind components in table I

SK (W) - Skewness parameter for windspeed in table I

S (U) - The standard deviation of the zonal wind component in table I

S (V) - The standard deviation of the meridional wind component in table I

S (W) - The standard deviation of windspeed in table I

t - A standardized normal variate used in text table B

U - The zonal wind component

UBAR - The mean value of the zonal wind component in table I

V - The meridional wind component

VBAR - The mean value of the meridional wind component in table I

W - Windspeed or modulus of wind vector, a scalar quantity

WBAR - The mean value of windspeed in table I

X - A general component variable or coordinate axis

Y - A general component variable or coordinate axis

$\bar{X}$ - A general component mean value in the [x,y] coordinate system

$\bar{Y}$ - A general component mean value in the [x,y] coordinate system

α (alpha) - Rotation angle for the [x,y] coordinate system

TABLE A. (concluded)

θ (theta) - Wind direction in the polar coordinate system
$\lambda_{(\ )}$ (Lambda) - A parameter in the bivariate normal probability distribution in text table C
ξ (Xi) - The mean value in the standardized normal probability distribution used in text table B
π (Pi) - Constant = 3.14159 ...
ρ (Rho) - The general linear correlation coefficient between the two component variables in the [x,y] coordinate system
σ_x, σ_y - The general standard deviations of the x and y component variables in the [x,y] coordinate system.

quantities. These data limits were used to screen the wind data base, as described in section I.C. The data base was considered to be free from errors under the following conditions:

1) The skewness of the windspeed was below 4.0 at data levels where the mean windspeed was less than 15 m/s, and

2) The skewness of the windspeed was below 2.5 at data levels where the mean windspeed was greater than 15 m/s.

A.3 Limitations

For the wind statistics, the correlation coefficients for like wind components and unlike wind components between altitude levels were not computed. Therefore, wind statistics with respect to altitude (profile) cannot be derived from the RRA statistics. For wind profile modeling techniques the user is referred to Smith (1976). However, the wind statistics at discrete altitudes are valid; all of the probability distribution functions given in chapter II can be derived from the five wind component statistical parameters contained in table I, and the derived distributions can be considered as wind models at discrete altitudes.

By convention, in the statistical literature Greek letters are used for population or theoretically known parameters, and sample estimates are denoted by English alphabetical letters or with a "hat" (^) over the Greek letters. In chapter II Greek letters are used for the variances and the linear correlation coefficient, and the means are denoted by $\overline{X}$ and $\overline{Y}$ when dealing with the bivariate normal distribution. It will always be understood that table I contains sample estimates of the statistical parameters and they are with respect to the meteorological U and V coordinate system.

B. Coordinate System and Computation of Statistical Parameters

B.1. Coordinate System

Wind measurements are recorded in terms of magnitude and direction. The wind direction is measured in degrees clockwise from true north and is the direction from which the wind is blowing. The wind magnitude (the modulus of the vector) is the scalar quantity and is referred to as windspeed or scalar wind. A statistical description that accounts for the wind as a vector quantity is appropriate and requires a coordinate system.

For the RRA the standard meteorological coordinate system has been chosen for the wind statistics, all tables of statistical parameters, and related discussions because the coordinate system used in aerospace and related applied fields has not always been consistent.

Using figure 1, the polar and Cartesian forms for the meteorological coordinate system are defined:

W = windspeed, scalar wind, or magnitude of the wind vector in meters per second.

θ = wind direction. θ is measured in degrees clockwise from true north and is the direction from which the wind is blowing.

U = zonal wind component, positive west to east, in meters per second.

V = meridional wind component, positive south to north, in meters per second.

The components θ and W define the polar form, and the U-V components define the Cartesian forms:

$$U = -W \sin\theta \quad , \quad 0 \le \theta \le 360° \tag{1}$$

$$V = -W \cos\theta \quad . \tag{2}$$

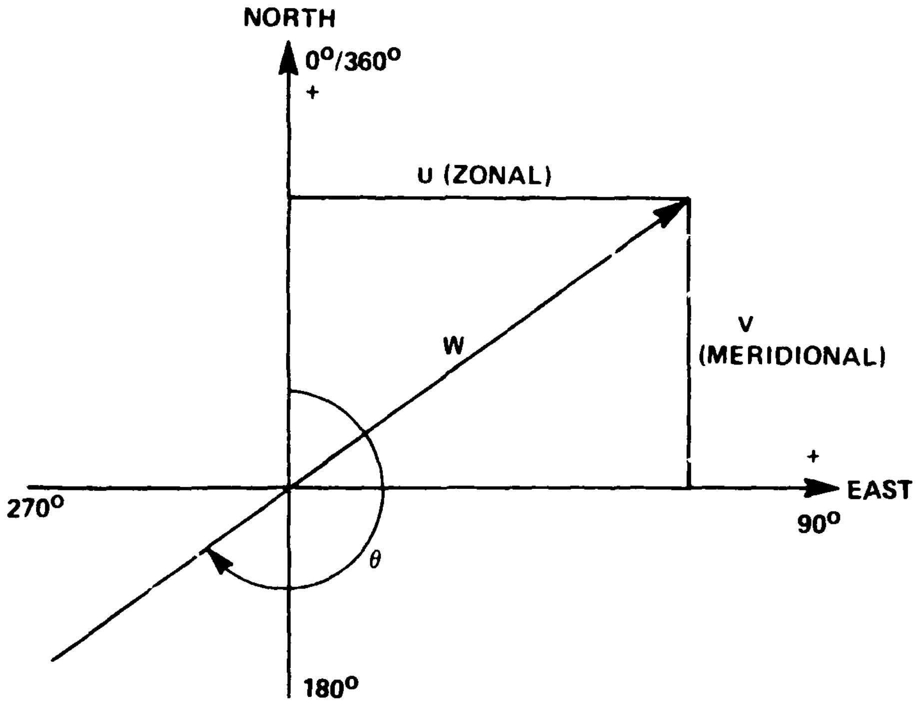

Figure 1. The meteorological coordinate system.

It is helpful to note the difference between the mathematical convention for a vector direction and the meteorological convention for wind direction:

$$\theta \text{ met} = 270 - \theta \text{ math} \tag{3}$$

when $0 \leq \theta$ math $\leq 270°$

$$\theta \text{ met} = 360 + (270 - \theta \text{ math})$$

when $270 \leq \theta$ math $\leq 360°$

B.2 Computation of Statistical Parameters

The wind statistical parameters in table I for the means and standard deviations of the U and V wind components and windspeed and the skewness parameter of windspeed were computed using the sums technique presented in chapter III.C.3. In addition, the linear (product moment) correlation coefficient between the U and V wind components, r (u,v) in table I, was computed. This correlation coefficient is defined as

$$r(u,v) = \frac{\sum_{i=1}^{n} (U_i - \bar{U})(V_i - \bar{V})}{N\ s(u) \cdot s(v)} \quad . \tag{4}$$

These statistical parameters are with respect to the Standard Meteorological Coordinate System.

C. Statistical Wind Models

C.1. Wind Component Statistics

The univariate normal (Gaussian) probability distribution function is used to obtain wind component statistics. In generalized notations, this probability density function (pdf) is

$$f(t) = \frac{e^{-\frac{t2}{2}}}{\sqrt{2\pi}} \quad , \tag{5}$$

where $t = X - \xi/\sigma_X$ is the standardized variate, with ξ defining the mean and σ_X the standard deviation. The probability distribution function (PDF) is

$$F(X) = \int_{-\infty}^{X} f(t)\, dt \quad . \tag{6}$$

Because this integral cannot be obtained in closed form, it is widely tabulated for zero mean and unit standard deviation. For a convenient reference for the RRA, selected values of F(X) are given in table B. To emphasize the connotation of probability, F(X) is shown in table B as $P\{X\}$.

The t values in table B are used as multiplier factors to the standard deviation to express the probability that a normally distributed variable, X, is less than or equal to a given value as

$$P\left\{X \leq \text{mean} + t\,\sigma_X\right\} = \text{probability, } p \quad . \tag{7}$$

For example, when t = 1.6449, the probability that X is less than or equal to the mean plus 1.6449 standard deviations is 0.95. That value of X that is less than or equal to the mean plus 1.6449 standard deviations is called the 95th percentile value of X. Also given in table B are the numerical values to express the probability that X falls in the interval X_1 and X_2; i.e.,

$$P\left\{X_1 \leq X \leq X_2\right\} = \text{Interpercentile Range} \quad , \tag{8}$$

where

$$X_1 = \bar{X} - t\,\sigma_x$$
$$X_2 = \bar{X} + t\,\sigma_x \quad .$$

For t = 1.9602 the probability that X lies in the interval X_1 and X_2 is 0.95. The values of X_1 and X_2 in this example comprise the 95th interpercentile range.

For a normally distributed variable, the mode (most frequent value) and the median (50th percentile value) are the same as the mean value. The means and standard deviations of the U and V wind components from table 1 are used in equations (7) and (8) to compute the percentile values and interpercentile ranges of the U and V wind components. When equation (7) is illustrated on a normal probability graph, a straight line is formed.

C.2. The Vector Wind Model

Because wind is a vector quantity having direction and magnitude that can be expressed as two components in an orthogonal coordinate system, a probability model that describes the joint relationship is the bivariate normal probability distribution. In general component notation, the bivariate normal probability density function (BNpdf) is

TABLE B. VALUES OF t FOR STANDARDIZED NORMAL (UNIVARIATE) DISTRIBUTION FOR PERCENTILES AND INTERPERCENTILE RANGES

t	P(X)	X	$P\{X_1 < X < X_2\}$ (%)
-3.0000	0.00135	$\xi - 3.0000\ \sigma$	99.73 (0.27)
-2.5758	0.00500	$\xi - 2.5758\ \sigma$	99 (1.00)
-2.3263	0.01000	$\xi - 2.3263\ \sigma$	98 (2.00)
-2.2365	0.01266	$\xi - 2.2365\ \sigma$	97.468 (2.532)
-2.0000	0.02275	$\xi - 2.0000\ \sigma$	95.45 (4.55)
-1.9602	0.02500	$\xi - 1.9602\ \sigma$	95 (5)
-1.6449	0.05000	$\xi - 1.6449\ \sigma$	90 (10)
-1.2816	0.10000	$\xi - 1.2816\ \sigma$	80 (20)
-1.0000	0.15866	$\xi - 1.0000\ \sigma$	68.268 (31.732)
-0.8416	0.20000	$\xi - 0.8416\ \sigma$	60 (40)
-0.6745	0.25000	$\xi - 0.6745\ \sigma$	50 (50)
-0.2533	0.40000	$\xi - 0.2533\ \sigma$	20 (80)
0.0000	0.50000	ξ	
0.2533	0.60000	$\xi + 0.2533\ \sigma$	
0.6745	0.75000	$\xi + 0.6745\ \sigma$	
0.8416	0.80000	$\xi + 0.8614\ \sigma$	
1.0000	0.84134	$\xi + 1.0000\ \sigma$	
1.2816	0.90000	$\xi + 1.2816\ \sigma$	
1.6449	0.95000	$\xi + 1.6449\ \sigma$	
1.9602	0.97502	$\xi + 1.9602\ \sigma$	
2.0000	0.97725	$\xi + 2.0000\ \sigma$	
2.2365	0.98734	$\xi + 2.2365\ \sigma$	
2.3263	0.99000	$\xi + 2.3263\ \sigma$	
2.5758	0.99500	$\xi + 2.5758\ \sigma$	
3.0000	0.99865	$\xi\ \ 3.0000\ \sigma$	

where $X_1 = \xi - t\sigma$
and $X_2 = \xi + t\sigma$

$$f(X,Y) = \frac{1}{2\pi\sigma_x\sigma_y\sqrt{1-\rho^2}}\left[\exp\ \frac{-1}{2(1-\rho^2)}\left\{\frac{(X-\bar{X})^2}{\sigma_x^2} - \frac{2\rho(X-\bar{X})(Y-\bar{Y})}{\sigma_x\sigma_y} + \frac{(Y-\bar{Y})^2}{\sigma_y^2}\right\}\right] \quad -\infty \leq X \leq \infty \text{ and}$$

$$-\infty \leq Y \leq \infty \quad , \tag{9}$$

where the five parameters are $\bar{x},\bar{y}$, the component means; σ_x, σ_y, the component standard deviations; and ρ, the correlation coefficient between the two component variables, X and Y.

For many applications the interest is in determining the probability that a point $\{X,Y\}$ will fall within a contour of equal probability density. The exponential terms of equation (9), when set equal to a constant, λ^2, give a family of ellipses depending on the value of the constant. The ellipses have a common center at the point $\{\bar{X},\bar{Y}\}$. Integration of equation (9) over the region bounded by the contours of equal probability density gives

$$P(\lambda) = 1 - e^{\frac{-\lambda^2}{2(1-\rho^2)}} \quad . \tag{10}$$

Solving for λ^2 and replacing $P(\lambda)$ by p gives

$$\lambda^2 = -2(1-\rho^2)\ \ln(1-p) \quad . \tag{11}$$

Now define

$$\lambda_e = \sqrt{2}\ \sqrt{-\ln(1-p)} \quad . \tag{12}$$

For ready reference and comparisons, λ_e is shown in table C for selected values of p.

TABLE C. VALUES OF λ FOR BIVARIATE NORMAL DISTRIBUTION ELLIPSES AND CIRCLES

P( )	λ_e (ellipse)	λ_c (circle)	P( )	λ_e (ellipse)	λ_c (circle)
0.000	0.0600	0.0000	65.000	1.4490	1.0246
5.000	0.3203	0.2265	68.268	1.5151	1.0713
10.000	0.4590	0.3246	70.000	1.5518	1.0973
15.000	0.5701	0.4031	75.000	1.6651	1.1774
20.000	0.6680	0.4723	80.000	1.7941	1.2686
25.000	0.7585	0.5363	85.000	1.9479	1.3774
30.000	0.8446	0.5972	86.466	2.0000	1.4142
35.000	0.9282	0.6563	90.000	2.1460	1.5175
39.347	1.0000	0.7071	95.000	2.4477	1.7308
40.000	1.0108	0.7147	95.450	2.4860	1.7579
45.000	1.0935	0.7732	98.000	2.7971	1.9778
50.000	1.1774	0.8325	98.168	2.8284	2.0000
54.406	1.2533	0.8862	98.889	3.0000	2.1213
55.000	1.2637	0.8936	99.000	3.0348	2.1460
60.000	1.3537	0.9572	99.730	3.4393	2.4320
63.212	1.4142	1.0000	99.9877	4.2426	3.0000

$$\lambda_e = \sqrt{2}\,\sqrt{-\ln(1-P)}$$

$$\lambda_c = \sqrt{-\ln(1-P)}$$

The probability ellipse that contains p-percent of the wind vectors expressed in the most general form is the conic defined by

$$AX^2 + BXY + CY^2 + DX + EY + F = 0 \quad . \tag{13}$$

where

$$A = \sigma_y^2$$

$$B = -2\rho\sigma_x\sigma_y$$

$$C = \sigma_x^2$$

$$D = 2\rho\sigma_x\sigma_y\bar{Y} - 2\sigma_y^2\bar{X} = -(B\bar{Y} + 2A\bar{X})$$

$$E = 2\rho\sigma_x\sigma_y\bar{X} - 2\sigma_x^2\bar{Y} = -(B\bar{X} + 2C\bar{Y})$$

$$F = A\bar{X}^2 + C\bar{Y}^2 + B\bar{X}\bar{Y} - AC(1 - \rho^2)\lambda_e^2 \quad .$$

and

$$\lambda_e = \sqrt{2}\sqrt{-\ln(1 - p)} \quad .$$

For graphical presentations, the range of the variable is important in order to arrange the scale. The largest and smallest values of X and Y for a given probability ellipse, p, are given by

$$X_{L,S} = \bar{X} \pm \sigma_x\lambda_e \tag{14}$$

$$Y_{L,S} = \bar{Y} \pm \sigma_y\lambda_e \quad . \tag{15}$$

where, as before, $\lambda_e = \sqrt{2}\ \sqrt{-\ln (1 - p)}$.

Although there are several approaches to graphing the probability ellipses, the following procedure is advantageous for electronic computer plotting. In establishing the computer plotting program, the sample estimates for $\overline{X}, \overline{Y}$, σ_x, σ_y, and ρ are constants in equation (13). The user makes the choice of probability ellipses desired. Thus, p in equation (12) is programmed as a parameter. The largest and smallest values for X and Y are computed by equations (14) and (15) for the largest probability ellipse selected. This sets the graphical scale. Values of X within the range of "X smallest" to "X largest" are obtained by incrementing X between these limits. Using the quadratic equation, a solution for Y of equation (13) is made and plotted for each value of X. The centroid $(\overline{X}, \overline{Y})$ for the family of probability ellipses is plotted as a point. Labeling and other identification complete the plotting program.

For a given probability, equation (13) defines an ellipse that contains p-percent of the points X,Y. Since the entire area under the bivariate normal density function [equation (9)] is unity, upon integration for a given probability ellipse, that given ellipse contains p-percent of the total area. In the wind statistics, p-percent of the wind vectors fall within the specified probability ellipse. From this point of view, a specified probability ellipse gives the joint probability that p-percent of the U-V components lie within the given ellipse.

When $\sigma_x^2 = \sigma_y^2 = \sigma^2$ and $\rho = 0$ in the bivariate normal distribution, the probability ellipses of equation (13) reduce to circles whose centers are at the means $\overline{X}, \overline{Y}$. The radii of the probability circles are $\sigma_{V1} \lambda_c$, where

$$\sigma_{V1} = \sqrt{2\sigma^2} \tag{16}$$

and

$$\lambda_c = \sqrt{-\ln (1 - p)} \quad . \tag{17}$$

Values for λ_c for selected probabilities, p, are given in table C.

Because this function is simple, it can easily be graphed manually. However, the generalized plotting technique for electronic computer plotters, as represented by equation (13), can be advantageously used.

C.3. Derived Distributions for Wind Statistics

In this subsection the probability distribution functions and sets of equations are presented to derive certain probability distribution functions for wind statistics. These derived probability distributions are:

1) The conditional distribution of wind components

2) The generalized Rayleigh distribution for windspeed

3) The distribution for wind direction

4) The conditional distribution of windspeed given a wind direction (wind rose).

The required five statistical parameters for these derived distributions for wind statistics are given in table I.

C.3.1 The Conditional Distribution of Wind Components

Given that two random variables X and Y are bivariate normally distributed, the conditional distribution $f(Y|X)$ is read as $f(Y)$ given X, and likewise $f(X|Y)$ is read as $f(X)$ given Y. The conditional probability distribution function $F(Y|X)$ has the mean $E(Y|X)$ and variance $\sigma^2_{(x|y)}$, where

$$E(Y|X^*) = \bar{Y} + \rho\left(\frac{\sigma_y}{\sigma_x}\right)(X^* - \bar{X}) \tag{18}$$

and

$$\sigma^2_{(y|x^*)} = \sigma_y^{\,2}\,(1 - \rho^2) \quad . \tag{19}$$

The conditional standard deviation is

$$\sigma_{(y|x^*)} = \sigma_y \sqrt{1 - \rho^2} \quad . \tag{20}$$

By interchanging the variables and parameters, the conditional distribution function for $F(X|Y^*)$ has the conditional mean

$$E(X|Y^*) = \bar{X} + \rho\left(\frac{\sigma_x}{\sigma_y}\right)(Y^* - \bar{Y}) \quad , \tag{21}$$

conditional variance

$$\sigma^2_{(x|y^*)} = \sigma_x{}^2\,(1 - \rho^2) \quad , \tag{22}$$

and conditional standard deviation

$$\sigma_{(x|y^*)} = \sigma_x \sqrt{1 - \rho^2} \quad . \tag{23}$$

The preceding conditional probability distribution functions are univariate normal distributions for a (fixed) given value for one of the bivariate normal variables. Thus, the t-values given in table B are applicable for conditional probability statements. For example,

$$F(Y|X^*) = E(Y|X^*) + t\sigma_{(y|x^*)} \quad . \tag{24}$$

For $t = 1.6449$ there is a 95 percent chance that Y is less than or equal to $\bar{Y} + 1.6449\ \sigma_{(y|x^*)}$ given that $X = X^*$. In symbols this statement reads

$$P\left\{ Y \leq E(Y|X^*) + 1.6449\ \sigma_{(y|x^*)}\ |X = X^* \right\} = 0.9500 \quad . \tag{25}$$

Interval probability statements can also be made; namely,

$$P\left\{ Y_1 = E(Y|X^*) - t\sigma_{(y|x^*)} \leq Y \leq Y_2 = E(Y|X^*) + t\sigma_y\ |X = X^* \right\}$$

where X^* can take on any fixed value of X, but a convenient arrangement is to let $X^* = \bar{X} \pm t\sigma_x$.

The close connection of the regression function of Y on X to the conditional mean for the bivariate normal distribution is noted; namely,

$$Y = \bar{Y} + \rho \left(\frac{\sigma_y}{\sigma_x} \right) (X - \bar{X}) \quad . \tag{26}$$

Similarly, the regression function of X on Y is

$$X = \bar{X} + \rho \left(\frac{\sigma_y}{\sigma_x} \right) (Y - \bar{Y}) \quad . \tag{27}$$

These are linear functions and express the same results as would be obtained from a least-squares regression line.

C.3.2. The Generalized Rayleigh Distribution for Windspeed

If two random variables, X and Y, are bivariate normally distributed, then the probability distribution for the modulus, R, can be derived in terms of the five parameters that define the bivariate normal distribution.

$$R = \sqrt{X^2 + Y^2} \tag{28}$$

The distribution of R so derived is called a generalized Rayleigh distribution because there are no restrictions on the parameters. For applications to the RRA, the variable R is recognized as windspeed or the modulus of the wind vector.

The probability density function for R is expressed as

$$f(R) = a_0 R e^{-a_1 R^2} \left[I_0(a_2 R^2)\, I_0(a_3 R) + 2 \sum_{k=1}^{\infty} I_k(a_2 R^2)\, I_{2k}(a_3 R) \cos 2k\varphi \right] \quad R \geq 0 \quad . \tag{29}$$

The functions $I_0(\cdot)$, $I_k(\cdot)$, and $I_{2k}(\cdot)$ are the modified Bessel functions of the first kind for zero order, kth order, and 2kth order. The coefficients are

$$a_0 = \exp\left[-\frac{1}{2}\left\{\frac{\bar{X}^2}{\sigma_a^2} + \frac{\bar{Y}^2}{\sigma_b^2}\right\}\right] \Big/ \sigma_a\sigma_b \quad ,$$

where σ_a^2 and σ_b^2 are the rotated variances to produce zero correlation between X and Y. σ_a and σ_b are the positive and negative roots[1] of the expression

$$\sigma^2_{(+,-)} = \frac{1}{2}\left\{\sigma_x^2 + \sigma_y^2 \pm \left[(\sigma_x^2 + \sigma_y^2)^2 - 4\sigma_x^2\sigma_y^2(1 - \rho^2)\right]^{1/2}\right\} \quad ,$$

$$a_1 = (\sigma_x^2 + \sigma_y^2)/4(1 - \rho^2)\,\sigma_x^2\sigma_y^2 \quad ,$$

$$a_2 = \frac{\left[(\sigma_x^2 - \sigma_y^2)^2 + 4\rho^2\sigma_x^2\sigma_y^2\right]^{1/2}}{4(1 - \rho^2)\,\sigma_x^2\sigma_y^2} \quad ,$$

$$a_3 = \left[\left(\frac{\bar{X}}{\sigma_a^2}\right)^2 + \left(\frac{\bar{Y}}{\sigma_b^2}\right)^2\right]^{1/2} \quad ,$$

---

1. *This computational form is obtained from the determinant*

$$\begin{vmatrix} \sigma_x^2 - K & \sigma_x\sigma_y\rho \\ \sigma_x\sigma_y\rho & \sigma_y^2 - K \end{vmatrix} \quad ,$$

where K is $\sigma^2_{(+,-)}$*, and* σ_a *and* σ_b *are analogous to the standard deviation of the major and minor axes of the bivariate normal probability ellipse.*

and

$$\tan \psi = \frac{\bar{Y}}{\bar{X}} = \frac{\sigma_a^2}{\sigma_b^2} \quad .$$

Since this density function cannot be integrated in closed form from zero to R, numerical integration is used to obtain practical results for the probability distribution function; i.e.,

$$F(R) = \int_0^{R*} f(R)\, dR \quad . \tag{30}$$

A number of special cases can be obtained from the general Rayleigh distribution [equation (29)], the simplest of which is to let $\sigma_x = \sigma_y = \sigma$ and $\bar{X} = \bar{Y} = 0$ with independent variables X and Y. This gives

$$f(R) = \frac{R}{\sigma^2} e^{-R^2/2\sigma^2} \quad , \tag{31}$$

which is recognized as the classical Rayleigh probability density function. The density function, equation (31), can be integrated in closed form over any range of the variable R. Hence, the probability distribution function, F(R), for equation (31) is

$$F(R) = 1 - \exp\left\{\frac{-R^2}{2\sigma^2}\right\} \quad . \tag{32}$$

C.3.3. The Derived Distribution of Wind Direction

Considering the wind as a vector quantity and bivariate normally distributed, the wind direction can be derived. This is done by first writing the bivariate normal probability density function in polar coordinates whose variables are

$$g(r,\theta) = r d_1 e^{-\frac{1}{2}(a^2r^2 - 2br + c^2)} , \tag{33}$$

(see footnote 2)

where

$$a^2 = \frac{1}{(1-\rho^2)}\left[\frac{\sin^2\theta}{\sigma_x^2} - \frac{2\rho\cos\theta\sin\theta}{\sigma_x\sigma_y} + \frac{\cos^2\theta}{\sigma_y^2}\right] ,$$

$$b = \frac{-1}{(1-\rho^2)}\left[\frac{\bar{x}\sin\theta}{\sigma_x^2} - \frac{\rho(\bar{x}\cos\theta + \bar{y}\sin\theta)}{\sigma_x\sigma_y} + \frac{\bar{y}\cos\theta}{\sigma_y^2}\right] ,$$

$$c^2 = \frac{1}{(1-\rho^2)}\left[\frac{\bar{x}^2}{\sigma_x^2} - \frac{2\rho\bar{x}\bar{y}}{\sigma_x\sigma_y} + \frac{\bar{y}^2}{\sigma_y^2}\right] ,$$

$$d_1 = \frac{1}{2\pi\sigma_x\sigma_y\sqrt{1-\rho^2}} ,$$

$r = \sqrt{x^2 + y^2}$ is the modulus of the vector or speed, and θ is the direction of the vector. After integrating $g(r,\theta)$ over $r = 0$ to ∞, the probability density function of θ is

$$g(\theta) = \frac{d_1}{a^2}\, e^{-\frac{1}{2}c^2}\left[1 + \sqrt{2\pi}\left(\frac{b}{a}\right) e^{\frac{1}{2}\left(\frac{b}{a}\right)^2} \Phi\left(\frac{b}{a}\right)\right] , \tag{34}$$

2. *This expression, equation (33), in Smith 1976) is given with respect to the mathematical convention for a vector direction.*

where a2, b, c2, and d_1 are as previously defined in equation (33) and

$$\Phi\left(\frac{b}{a}\right) = \Phi\ (x) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{x} e^{-\frac{1}{2} t^2}\ dt$$

is taken from tables of normal distribution functions or made available through a computer subroutine.

If desired, equation (34) can be integrated numerically over a chosen range of θ to obtain the probability that the vector direction will lie within the chosen range; i.e.,

$$F(\theta) = \int_{\theta_2}^{\theta_1} g(\theta)\ d\theta \quad . \tag{35}$$

One application may be to obtain the probability that the wind will flow from a given quadrant or sector as, for example, onshore.

C.3.4. The Derived Conditional Distribution of Windspeed Given the Wind Direction (Wind Rose)

Continuing with the considerations in section C.3.3. of this chapter, the conditional probability density function (pdf) for windspeed, r, given a specified value for the wind direction, θ, can be expressed as

$$f(r|\theta) = \frac{a^2\ r\ e^{-\frac{1}{2}(a^2\ r^2\ -\ br)}}{1 + \sqrt{2\pi}\left(\frac{b}{a}\right) e^{\frac{1}{2}\left(\frac{b}{a}\right)^2}\ \Phi\left\{\frac{b}{a}\right\}} \quad . \tag{36}$$

where the coefficients, $\underline{a}$ and $\underline{b}$ and the function $\Phi\left\{\frac{b}{a}\right\}$ are as previously defined in equation (33) and in equation (34).

From equation (36) the mode (most frequent value) of the conditional windspeed given a specified value of the wind direction is the positive solution of the quadratic equation,

$$a^2\ r^2\ -\ br\ -\ 1 = 0 \quad , \tag{37}$$

which is

$$(\tilde{r}\,|\,\theta) = \frac{1}{2a}\left[\left(\frac{b}{a}\right) + \sqrt{4 + \left(\frac{b}{a}\right)^2}\right] \quad . \tag{38}$$

The locus of the conditional modal values of windspeed when plotted in polar form versus the given wind directions forms an ellipse.

The noncentral moment for equation (36) is expressed as

$$\mu_n' = \int_0^\infty r^n \; f(r\,|\,\theta)\; dr \quad . \tag{39}$$

Now the first noncentral moment is identical to the first central moment or the expected value, E $(r|\theta)$. The integration of equation (39) for the first moment is sufficiently simple to yield practical computations and can be expressed as

$$E(r\,|\,\theta) = \frac{\left(\frac{b}{a}\right) + \left[1 + \left(\frac{b}{a}\right)^2\right]\sqrt{2\pi}\; e^{\frac{1}{2}\left(\frac{b}{a}\right)^2}\;\Phi\left\{\frac{b}{a}\right\}}{a\left[1 + \left(\frac{b}{a}\right)\sqrt{2\pi}\; e^{\frac{1}{2}\left(\frac{b}{a}\right)^2}\;\Phi\left\{\frac{b}{a}\right\}\right]} \quad . \tag{40}$$

Hence, equation (40) gives the conditional mean value of the windspeed given a specified value for the wind direction.

The integration of equation (36) for the limits r = 0 to r = r* gives the probability that the conditional windspeed is $\leq$ r* given a value for the wind direction, θ. This conditional probability distribution (PDF) can be written as

$$\Pr\left\{r \leq r^* \;|\; \theta = \theta_c\right\} = 1 - \left[\frac{e^{-\frac{1}{2}r_s^2} + \sqrt{2\pi}\left(\frac{b}{a}\right)\left\{1 - \Phi\;(r_s)\right\}}{e^{-\frac{1}{2}\left(\frac{b}{a}\right)^2} + \sqrt{2\pi}\left(\frac{b}{a}\right)\Phi\left\{\frac{b}{a}\right\}}\right] , \tag{41}$$

where $r_s = \left[a\; r^* - \left(\frac{b}{a}\right)\right]$.

By definition, equation (41) is an expression for a "wind rose." Empirical wind rose statistics are often tabulated or graphically illustrated giving the frequency that the windspeed is not exceeded for those windspeed values that lie within assigned class intervals of the wind direction. After evaluation of equation (41) for various values of windspeed, r^*, and the given wind directions, θ, interpolations can be performed to obtain various percentile values of the conditional windspeed.

For the special case when $\underline{b}$ in equation (33) equals zero (i.e., for $\bar{x} = \bar{y} = 0$), the conditional modal values of windspeeds [equation (38)], the conditional mean values of windspeeds [equation (40)], and the fixed conditional percentile values of windspeeds [interpolated from evaluations of equation (41)], when plotted in polar form versus the given wind directions, produce a family of ellipses.

For the special case when $\bar{x} = \bar{y} = 0$, equation (36) reduces to the following simple case:

$$\Pr\left\{ r \leq r^* \mid \theta = \theta_0 \right\} = 1 - e^{-\frac{a^2 r^{*2}}{2}} \quad . \tag{42}$$

There is a special significance of equation (42) when related to the bivariate normal probability distribution. If r^* and θ are measured from the centroid of the probability ellipse, then the probability that $r \leq r^*$ is the same as the given probability ellipse. Further, solving equation (42) for r^*, gives

$$r^* = \frac{1}{a} \sqrt{-2 \ln (1 - P)} \quad . \tag{43}$$

If a probability ellipse P is chosen, equation (42) gives the distance of r along any θ from the centroid of the ellipse to the intercept of the specified probability ellipse. If there is an interest in conditional probability of winds for a given θ relative to the monthly means, equation (43) is applicable. If it is desired to find the magnitude of the wind along any θ relative to the monthly mean to the intercept of a given probability ellipse, equation (43) is applicable.

D. Statistical Parameters With Respect To Any Orthogonal Axes

The five wind statistical parameters presented in table I are given with respect to the standard meteorological coordinate system; i.e., these parameters are for the U and V components. For many aerospace vehicles and range applications, there is a need for wind statistics with respect to orthogonal axes other than west to east and south to north. For example, it may be required to present wind statistics with respect to a flight azimuth of an

aerospace vehicle whose flight azimuth is α degrees from true north measured in a clockwise direction. The following sets of equations are presented to compute the five parameters for the new coordinate axes rotated α degrees clockwise from true north.

a. Rotation of the means through α degrees:

$$\bar{X}_\alpha = \bar{X} \cos (90 - \alpha) + \bar{Y} \sin (90 - \alpha) \tag{44}$$

$$\bar{Y}_\alpha = \bar{Y} \cos (90 - \alpha) - \bar{X} \sin (90 - \alpha) \quad . \tag{45}$$

b. Rotation of the variances through α degrees:

$$\sigma_{x_\alpha}^2 = \sigma_x^2 \cos^2 (90 - \alpha) + \sigma_y^2 \sin^2 (90 - \alpha)$$

$$+ 2\rho\sigma_x\sigma_y \cos (90 - \alpha) \sin (90 - \alpha) \tag{46}$$

$$\sigma_{y_\alpha}^2 = \sigma_y^2 \cos^2 (90 - \alpha) + \sigma_x^2 \sin^2 (90 - \alpha)$$

$$- 2\rho\sigma_x\sigma_y \cos (90 - \alpha) \sin (90 - \alpha) \quad . \tag{47}$$

c. Rotation of the linear correlation coefficient through α degrees:

$$\rho_\alpha = \frac{\text{cov } (X,Y)_\alpha}{\sigma_{x_\alpha} \sigma_{y_\alpha}} \quad , \tag{48}$$

where cov $(X,Y)_\alpha$ is the rotated covariance,

$$\text{cov } (X,Y)_\alpha = \text{cov } (X,Y) \left[\cos^2 (90 - \alpha) - \sin^2 (90 - \alpha)\right]$$

$$+ \cos (90 - \alpha) \sin (90 - \alpha) (\sigma_y^2 - \sigma_x^2)$$

and

$$\operatorname{cov}(X,Y) = \rho\sigma_x\sigma_y \quad .$$

By using these rotational equations, the bivariate normal distribution with respect to any desired rotated coordinates can be obtained from sample estimates that have been computed with respect to a specific axis. The marginal distributions after rotation are also normally (univariate) distributed. Using the rotational equations greatly reduces computational efforts for applications requiring statistics with respect to several coordinate axes.

Appendix A presents some illustrative examples for the wind statistics of the specific RRA.

CHAPTER III. STATISTICS OF THERMODYNAMICS QUANTITIES AND MODELS

A. General Considerations

A.1. Objectives

The objective inherent in developing the thermodynamic section of the RRA was to describe the thermodynamic characteristics of the atmosphere using a minimum of data tabulations. A set of parameters was selected which, together, thermodynamically describe the climatological state of the atmosphere. These parameters are the pressure, temperature, density, dewpoint, virtual temperature, and water vapor pressure. Used together, these parameters permit the calculation of a large number of derived quantities. (Symbols used in the calculations in this chapter are summarized in table D.) Some of these quantities, such as the speed of sound, are dealt with in section III.E.

The probability distribution of each of the six thermodynamic RRA parameters is described by its mean value, its standard deviation, and its skewness. Several of these parameters (temperature, pressure, dewpoint and density) have probability distributions that are close to a univariate normal distribution; the others do not. The skewness parameter gives an estimate of the asymmetrical departures of a probability distribution.

Hydrostatically modeled mean values of pressure and density were calculated (table IV), so that users may determine the departure of the actual climatological values of these parameters from hydrostatic conditions. This was done by hydrostatically integrating the pressure from the lowest RRA data level to the termination altitude of the particular RRA.

A.2. Data Quality Control

Data limits derived from the following parameters were used to screen the thermodynamic portion of the RRA data base: temperature, pressure, dewpoint (for the 0- to 30-km portion only), and density (for the 30- to 70-km portion only). These limits were set to plus and minus six standard deviations from the mean values of each of these quantities. These limits were used to screen the thermodynamic portion of the RRA data base, according to the procedures described in section I.C. The data base used to generate the thermodynamic portion of the RRA (tables I, II, and IV) was considered to be free from errors under the following conditions:

a) The skewness values of the pressure and temperature were between -2.5 and 2.5 at all data levels.

b) The skewness values of the density were between -3.5 and 3.5 at data levels between 0 and 30 km.

c) The skewness values of the density were between -3.0 and 3.0 at data levels between 30 and 70 km.

d) The skewness values of the dewpoint were between -2.5 and 2.5 at all data levels with more than 10 data values.

TABLE D. LIST OF SYMBOLS USED IN CHAPTER III

C_s	-	Speed of sound
C_d	-	Collision diameter
E	-	Vapor pressure
g_ϕ	-	Gravity at latitude ϕ
H	-	Geopotential height
H_m	-	Geopotential height at a mandatory radiosonde data level
H_s	-	Geopotential height at a significant radiosonde data level
K_t	-	Coefficient of thermal conductivity
L	-	Mean free path length
M	-	Mean molecular weight of air at sea level
M3Q	-	**Annual or monthly third moment of quantity Q**
n	-	Refractive modulus
N	-	Refractive index
NA	-	Avogadro's constant
N_Q		Number of values of quantity Q
P	-	Pressure
P_m	-	Pressure at a mandatory radiosonde data level
P_s	-	Pressure at a significant radiosonde data level
P_h	-	Hydrostatically integrated mean monthly or annual pressure
Q	-	Any tabulated RRA quantity
R*	-	Universal gas constant
R'	-	Specific gas constant of dry air
r', r*	-	Parameters used in converting z to h and vice versa

TABLE D. (concluded)

S	- Sutherland's constant, used in the calculation of dynamic viscosity
T	Temperature
T_d	- Dew point
T_v	- Virtual temperature
T_{vm}	- Virtual temperature at a mandatory radiosonde data level
T_{vs}	Virtual temperature at a significant radiosonde data level
V	Mean air particle speed
V_c	Mean collision frequency
w	Parameter used in the hydrostatic interpolation of pressure and density
Z	Geometric altitude
	Wavelength
Q	Skewness of quantity Q
	Constant used in the equation for viscosity
	Ratio of specific heat at constant pressure to specific heat at constant volume
	Kinematic coefficient of viscosity
	Dynamic coefficient of viscosity
	Density
h	Mean monthly or annual density derived from pressure height
	Standard deviation of the quantity Q

A.3. Limitation of Thermodynamic Statistics

The correlation coefficients between the thermodynamic quantities and the moisture-related quantities were not calculated at discrete altitudes, nor were any of the correlations between altitudes. Therefore, valid statistical dispersion models that require the relationship between two or more of these quantities at the same altitude or between altitudes cannot be derived. Approximations for the correlation coefficients between pressure, virtual temperature, and density at discrete altitudes may be obtained from the coefficients of variation as developed by Buell (1970). The coefficient of variation is the standard deviation divided by the mean. The mean values and the standard deviations are taken from table II. A model for the profile of monthly and annual mean pressure, virtual temperature, and density that is in excellent agreement with the respective statistical mean values is given by table IV. This agreement results because the physical relationships, given by the hydrostatic equation and the equation of state, were used to derive table IV. When only the monthly or annual mean values for pressure, virtual temperature, and density are required, it is recommended that table IV be used.

B. Establishing Data Samples at the Required Altitude Levels

This section describes the computational procedures used to establish data samples of the thermodynamic RRA parameters at the RRA data levels. References are cited only when an equation given is one of many available in the literature or when an equation is stated in an unusual form.

B.1. Conversion of Data Recorded in Geopotential Heights to Geometric Altitude

The upper air rocketsonde observations used to obtain the table values above 30 km were recorded in terms of geometric altitude and can be interpolated directly to the altitude intervals shown in the tables. However, the radiosonde observations used to obtain the tabular values below 30 km were recorded in terms of geopotential heights. The change of coordinates from geopotential heights to geometric altitudes (h to z) is accomplished by calculating a table of geopotential heights that correspond exactly to the geometric altitudes at which the atmospheric parameters are tabulated. The radiosonde observations are then interpolated to these geopotential heights. The relationship used to calculate geometric altitude from geopotential height is

$$H = (r'z)/(r^*z) \quad , \tag{49}$$

where

$$r' = gr^*/9.80665$$

and

$$r^* = -2g_\phi/(\partial g_\phi/\partial z_o) \quad .$$

g_ϕ is the sea-level gravity at the latitude ϕ corresponding to the proper location. This value is given by (List, 1968)

$$g_\phi = 9.780356\ (1 + 5.2885 \cdot 10^{-3} \sin^2 \phi - 5.9 \cdot 10^{-6} \sin^2 (2\phi)). \tag{50}$$

$\frac{\partial g_\phi}{\partial z_0}$ is the rate of change of gravity at the sea level. This quantity is given by the equation

$$\frac{\partial g_\phi}{\partial z_0} = -3.085462 \cdot 10^{-6} + 2.27 \cdot 10^{-9} \cos (2\phi) - 2 \cdot 10^{-12} \cos (4\phi). \tag{51}$$

The units used for gravity are meters per square second, while the units for $\frac{\partial g_\phi}{\partial z_0}$ are per square second.

The resulting table of values of H obtained by using even increments of 2 in equation (49) is shown in table IV of the RRA. The values of H above 30 km are not used in the interpolation of original data, but are included for the convenience of the user.

B.2. Calculations on the Original Rawinsonde Data Records

It was necessary to interpolate the information from the original rawinsonde data records to the geometric altitudes specified as the RRA data levels. The parameters for which this interpolation was required were the temperature, dewpoint, and pressure. The other parameters were calculated from the interpolated values at each RRA data level. These "derived" parameters were the water vapor pressure, density, and virtual temperature.

B.2.1. Calculation of the Geopotential Height at Significant Levels

Two somewhat different interpolation procedures were used to obtain data from radiosonde and rocketsonde observations at the levels shown in the tables. The procedure used to interpolate radiosonde observations began with the calculation of virtual temperature at each data level in a sounding. The virtual temperature was computed by

$$T_v = T/(1. - 0.379\ (e/p)) \quad , \tag{52}$$

where T_v and T are in degrees Kelvin and e and p are in millibars.

The radiosonde soundings contain a mix of data taken at "mandatory" and "significant" levels. Pressure, temperature, and dewpoint information was given in these soundings at both types of levels. However, geopotential height information was only given at the mandatory levels. The heights at the significant levels were "filled in" (calculated) hydrostatically using pressure and temperature data from these levels. This procedure permitted the use of most of the significant level data in the calculation of the RRA tables. The equation used for this process was

$$H_s = H_m + 29.2712617 \; \frac{(T_{vs} - T_{vm})}{2} \; \ln(P_s/P_m) \quad , \tag{53}$$

where the subscripts s and m denote quantities at significant and mandatory levels. This equation was not used if the difference between two adjacent mandatory levels was greater than 200 mb. All soundings with such data gaps were rejected for use in compiling the RRA.

B.2.2. Temperature

Radiosonde temperatures were interpolated logarithmically with respect to pressure using the equation

$$T = T_U + (T_L - T_U) \frac{\ln p - \ln p_L}{\ln p_U - \ln p_L} \quad , \tag{54}$$

where the subscripts U and L indicate values at the nearest data levels in the actual sounding above and below the interpolated level.

B.2.3. Pressure

The pressure values in each radiosonde sounding were interpolated to the RRA data levels using the equation

$$p = p_L \; \exp\left(\frac{H_L - H_U}{29.2712617 \; (0.5) \; (T_{v_U} + T_{v_L})} \right) \tag{55}$$

where the subscript L indicates virtual temperature, geopotential height, and pressure values at the data level below and closest to the level at which data were required.

B.2.4. Dewpoint Temperature

Dewpoint values were interpolated logarithmically with respect to pressure using the equation

$$T_d = T_{dU} + (T_{dL} - T_{dU}) \left(\frac{\ln p - \ln p_L}{\ln p_U - \ln p_L} \right) \quad . \tag{56}$$

The subscripts U and L indicate data at the nearest upper and lower data levels in a sounding.

B.2.5. Derived Water Vapor Pressure

The water vapor pressure was calculated from the interpolated dewpoint values at the RRA data levels using Teten's approximation:

$$e = 6.11 \text{ mb} \times 10^{7.5(T_d - 273.15)/(T_d - 35.86)} \quad . \tag{57}$$

B.2.6. Derived Density

The density values derived from radiosonde observations were calculated at the RRA data levels using the equation

$$\rho = 348.36787 \; p/T_v \quad . \tag{58}$$

B.2.7. Derived Virtual Temperature

The virtual temperature values were calculated at the RRA data levels for each sounding using the equation

$$T_v = T/(1 - 0.379(e/p)) \quad , \tag{59}$$

where T_v and T are in degrees Kelvin, and p and e are the pressure and vapor pressure, respectively, in millibars.

B.3. Calculations on the Original Rocketsonde Data Records

The rocketsonde data records used to calculate the RRA table values above 30 km were given in terms of geometric altitude. For this reason, slightly different calculations were required to convert the recorded data values to values at the RRA data levels. The pressure, temperature, and density were all interpolated to the RRA data levels; moisture-related parameters (virtual temperature, water vapor pressure, and dewpoint) were not calculated, since atmospheric moisture at altitudes above 30 km was considered to be negligible.

No interpolation was done across gaps in the pressure or temperature data within a sounding larger than 7,000 m. Data values at the RRA levels within such a gap were set to missing.

B.3.1. Temperature

Rocketsonde temperatures were interpolated linearly with respect to geometric altitude using the equation

$$T = T_U + (T_L - T_U) \frac{Z - Z_L}{Z_U - Z_L} , \qquad (60)$$

where the subscripts U and L indicate values at the nearest data level in the actual sounding above and below the interpolated level.

B.3.2. Pressure

The pressure values in each rocketsonde sounding were interpolated to the RRA data levels using the equation

$$P = P_L \exp\left(- \frac{g_\phi}{R^*} \frac{M(Z - Z_L)}{\overline{T}v} \cdot W^2\right) , \qquad (61)$$

where $\overline{T}_v = \frac{Tv_U + Tv_L}{2}$ and $W = \frac{r^*}{\left(r^* + Z + \frac{Z - Z_L}{2}\right)}$.

B.3.3. Density

Rocketsonde density values were interpolated using the equation

$$\rho = \rho_L \exp\left(- \frac{g_\phi M}{R^*} \frac{(Z - Z_L)}{\overline{T}_v} \cdot W^2 \right) , \qquad (62)$$

where W is specified in section III.B.3.2.

C. Computation of Statistical Parameters for Tables II and III

A three-step procedure was used for computing the monthly and annual means, standard deviations, and skewness values from the data values at the RRA data levels. Initially, certain statistical sums were calculated and stored as the soundings in the data base were processed. These sums were then used to calculate the monthly statistics given in the RRA tables. The annual statistics were then calculated from these stored sums and the monthly statistics.

C.1. Stored Statistical Sums

The sums calculated were

$$\sum Q, \ \sum Q^2, \text{ and } \sum Q^3 \quad ,$$

where Q is any one of the quantities given in the thermodynamic part of the RRA.

C.2. Calculation of the Monthly Statistics

C.2.1. Monthly Means

The mean monthly values of the thermodynamic RRA quantities were calculated using the equation

$$\bar{Q} = \sum Q / N_Q \quad ,$$

where N_Q is the number of observed values of the quantity Q for a given month.

C.2.2. Monthly Standard Deviations

The monthly standard deviations of the thermodynamic RRA quantities were calculated using the equation

$$\sigma_Q = \sqrt{\frac{(N_Q \Sigma Q^2) - (\Sigma Q)^2}{N_Q \cdot (N_Q - 1)}} \quad . \tag{63}$$

C.2.3. Monthly Skewness Values

The monthly skewness values of the windspeed and of the thermodynamic RRA quantities were calculated using the equation

$$\alpha_Q = \frac{M3_Q}{\sigma_Q^3} \quad ,$$

where $M3_Q$ is the third moment of the quantity Q, σ_Q is its standard deviation, and

$$M_{3Q} = \left[\frac{\Sigma Q^3}{N_Q} - \frac{3 \Sigma Q \Sigma Q^2}{N_Q^2} - \frac{2 \Sigma Q^3}{N_Q^3} \right] \cdot \frac{N_Q^2}{(N_Q - 1)(N_Q - 2)} \quad . \tag{64}$$

C.3. Calculation of the Annual Statistics

Equations (63) and (64), used to calculate the monthly values of the standard deviations and skewness values, involve taking the differences between two pairs of large sums containing Q^2 and Q^3, where Q is any thermodynamic RRA quantity. Using these equations to compute the annual statistics would have resulted in a substantial loss of precision, as these sums become larger by several orders of magnitude in such a case. This problem was avoided by calculating the annual means, standard deviations, and skewness values from the monthly statistics.

C.3.1 Annual Mean Values

The annual mean values of the thermodynamic RRA quantities were calculated using the equation

$$Q_{ANN} = Q_A / N_Q \quad ,$$

where Q_A is the total of all observed values of Q and N_Q is the total number of observations of Q.

C.3.2. Annual Standard Deviations

The annual standard deviations of the thermodynamic RRA quantities were calculated using the equation

$$\sigma Q_{ANN} = \sqrt{\frac{1}{N_Q} \sum_{i=1}^{12} (N_{Qi}\ \sigma_{Qi}{}^2) + \frac{1}{N_Q} \sum_{i=1}^{12} (N_{Qi}\ \bar{Q}_i{}^2) - Q_{ANN}{}^2} \quad , \qquad (65)$$

where N_{Qi} = the number of data values for Q in month i (i = 1 to 12), Q_i = the monthly mean of Q, and σ_{Qi} = the standard deviation of quantity Q in month i.

C.3.3. Annual Skewness Values

The annual skewness values of the thermodynamic RRA quantities were calculated using the equation

$$M3Q_{ANN} = \frac{1}{N} \sum_{i=1}^{12} (N_{Qi} M_{3Qi}) + \frac{3}{NQ_{ANN}} \sum_{i=1}^{12} (N_{Qi} \bar{Q}_i \sigma_{Qi}^2)$$

$$+ \frac{1}{NQ_{ANN}} \sum_{i=1}^{12} (N_{Qi} Q_i^3) - \frac{3\bar{Q}_{ANN}}{NQ_{ANN}} \sum_{i=1}^{12} (N_{Qi} Q_i^2)$$

$$- \frac{3\bar{Q}_{ANN}}{NQ_{ANN}} \sum_{i=1}^{12} (N_{Qi} \sigma_{Qi}^2) + 2\bar{Q}_{ANN}^3 \quad , \qquad (66)$$

where M_{3Qi} = the third moment about the mean of quantity Q in month i and $M3Q_{ANN}$ = the annual third moment about the mean of the quantity Q.

D. Derived Monthly Mean and Annual Mean Model Atmospheres

A set of modeled monthly mean and annual mean hydrostatic values of pressure and density was calculated from the lowest RRA data level (0 km, mean sea level) upwards to 30 km, and from 30 km upwards to 70 km. The integration from 0 to 30 km was computed independently of the integration from 30 to 70 km because of the difference in data sources. The two different values for 30 km are provided for comparison. When 30-km data are required, the values given in the 0- to 30-km table should be used. These hydrostatically modeled mean values, which are given in table IV, are useful as a check on the validity of the pressure and density values given in table II. In most cases, the values in tables II and IV for any given data level are within 1 percent of each other. The hydrostatic pressure values in table IV were calculated using the equation

$$p_1 = p_0 \exp\left(- \frac{0.034162\ (H_1 - H_0)}{0.5\ (T_{v_1} + T_{v_0})} \right) \quad . \qquad (67)$$

where $H_1 - H_0$ is in meters and a "0" subscript refers to values at the RRA data level immediately below the level being checked. p_0 at the lowest data level is set equal to the RRA mean pressure; p_1, calculated for the next highest data level, is taken as p_0 for the level above that. This process is repeated for all the other RRA data levels. The hydrostatic density corresponding to the hydrostatic pressures is calculated from these pressures and the RRA virtual temperature values using the formula

$$\rho_H = 348.36786\ P_H/T_v \quad . \qquad (68)$$

where ρ_H and P_H are the hydrostatic density and pressure shown in table IV of the RRA.

E. Thermodynamic Quantities Derivable from the Basic Tables

Several other quantities can be calculated from the statistics listed in tables I and II. Primary physical constants used in these calculations are listed in table E. The equations given in this section can be used to calculate the approximate mean values of these quantities at each RRA data level. It is not possible to infer or derive any information concerning the standard deviation or skewness values of these quantities from the data in tables II and III of the RRA.

E.1. Mean Air Particle Speed

The mean air particle speed, V, is the arithmetic average of the speeds of all air particles in the volume element being considered. For a valid average to occur, there must be a sufficient number of particles involved to represent mean conditions. The equation for V for dry air is

$$V = \sqrt{\frac{8}{\pi} \cdot \frac{R^*T}{M}} \quad . \tag{69}$$

A computational form for dry air, using tabulated values, is

$$V = \sqrt{7.3094 \times 10^2 \times T} \text{ (meters per second)} \quad , \tag{70}$$

where T is the temperature in degrees Kelvin from table II. Equation (69), when corrected for moist air, becomes

$$V = \sqrt{\frac{8}{\pi} \cdot R' \, T_V} \quad . \tag{71}$$

The computational form for moist air is

$$V = \sqrt{7.3094 \cdot 10^2 \cdot T_V} \text{ (meters per second)} \quad , \tag{72}$$

where T_V is the virtual temperature in degrees Kelvin from table III.

TABLE E. LIST OF PRIMARY PHYSICAL CONSTANTS

P_o = standard atmospheric pressure at sea level
= 1.013250×10^5 Newton/m^2 = 2116.22 lb/ft^2

ρ_o = standard atmospheric density at sea level
= 1.2250 kg/m^3 = 0.076474 lb/ft^3

T_o = standard temperature at sea level = 288.15 K = 15.0°C = 59.0°F

g_o = standard gravity at sea level at latitude 45°32'33"
= 9.80665 m/s^2

S = Sutherland's constant used in calculation of dynamic viscosity
110.4 K

T_I = ice-point temperature at P_o = 273.15 K

β = constant used in calculation of dynamic viscosity
= 1.458×10^{-6} kg/s m $K^{1/2}$
= 7.3025×10^{-7} lb/s ft $R^{1/2}$

γ = ratio of specific heat of air at constant pressure to specific heat of air at constant volume
= 1.4

C_D = mean effective collision diameter of air molecules
= 3.65×10^{-10} m = 1.1975×10^{-9} ft

N_a = Avogadro's constant
= 6.022169×10^{26}/kg mol = 2.73179×10^{26}/lb mol

R* = gas constant = 8.31432 J/mol K

R' = gas constant for dry air = 2.8704×10^2 J/kg K

M = molecular weight of dry air = 28.966 g/mol

E.2. Mean Free Path

The mean free path, L, is the mean value of the distance traveled by each neutral air particle in a selected air parcel, between successive collisions with other particles in that parcel. A meaningful average requires that the selected parcel be large enough to contain a substantial number of particles. The equation for L is given by

$$L = \left(\frac{\sqrt{2}}{2\pi}\right)\left(\frac{R^*T}{N_a\ C_d^{\ 2}\ P}\right) \quad , \tag{73}$$

where C_d is the effective collision diameter of the mean air molecules. The 1976 standard atmosphere value of 3.65×10^{-10} is valid for the range of altitudes in the RRA.

A computational form for moist air, using tabulated values, is

$$L = 2.335 \times 10^{-7}\ \frac{T}{P}\ \text{(meters)} \quad , \tag{74}$$

where T is the temperature in degrees Kelvin from table II and P is the pressure in millibars from table II.

A form of (73) to correct L for moist air is

$$L = \left(\frac{\sqrt{2}}{2\pi}\right)\frac{R'MT_v}{N_a\ C_d^{\ 2}} \quad . \tag{75}$$

The computational form for moist air is

$$L = 2.3325 \times 10^{-7}\ \frac{T_v}{P}\ \text{(meters)} \quad , \tag{76}$$

where T_v is the virtual temperature in degrees Kelvin from table III and P is the pressure in millibars from table II.

E.3. Mean Collision Frequency

The mean collision frequency, V_c, is considered to be the average speed of air particles contained in an air parcel, divided by the mean free path of the particles inside that parcel. Computationally this is equivalent to

$$V_c = \frac{V}{L}\ (\mathrm{sec}^{-1}) \quad . \tag{77}$$

To determine V_c for dry air, use V and L from equations (70) and (74). To determine V_c for moist air, use V and L from equations (72) and (76).

E.4. Speed of Sound

The expression for the speed of sound, C_s, in meters per second in dry air, is

$$C_s = \sqrt{\frac{\gamma R^* T}{M}} \quad . \tag{78}$$

To compute C_s for dry air from tabulated values, use

$$C_s = \sqrt{4.0185 \cdot 10^2 \cdot T} \quad \text{(meters per second)} \quad , \tag{79}$$

where T is the temperature in degrees Kelvin from table II. One form for the speed of sound in moist air is

$$C_s = \sqrt{\gamma R' T_v} \quad , \tag{80}$$

where T_v is the virtual temperature from table III. A computational form for moist air is

$$C_s = \sqrt{4.0185 \cdot 10^2\ T_v} \quad \text{(meters per second)} \quad , \tag{81}$$

E.5. Dynamic Coefficient of Viscosity

The coefficient of dynamic viscosity, μ, is defined as a coefficient of internal friction developed where gas regions move adjacent to each other at different velocities. The following expression is taken from the U.S. Standard Atmosphere (1976):

$$\mu = \frac{\beta \cdot T^{3/2}}{T + S} \quad . \tag{82}$$

The computational form is

$$\mu = \frac{(1.458 \times 10^{-6})\ T^{3/2}}{T + 110.4} \quad \text{(kilograms per second per meter)}\ , \tag{83}$$

where T is temperature degrees Kelvin from table II.

E.6. Kinematic Coefficient of Viscosity

The kinematic coefficient of viscosity, designated as ν, is defined to be the ratio of the dynamic coefficient of viscosity of a gas to its density, or

$$\nu = \mu/\rho\ . \tag{84}$$

The computational form is

$$\nu = 1.0 \times 10^{3}\ \mu/\rho \quad \text{(square meters per second)}\ , \tag{85}$$

where μ is the dynamic coefficient of viscosity from equation (83) and ρ is the density in grams per cubic meter from table II.

E.7. Coefficient of Thermal Conductivity

The empirical expression used for the coefficient of thermal conductivity, designated as K_t, is given in the 1976 Standard Atmosphere as

$$K_t = \frac{2.65019 \times 10^{-3} \cdot T^{3/2}}{T + 245.4 \times 10^{-(12/T)}} \quad \text{(watts per meter per degree Kelvin)}\ , \tag{86}$$

where T is in degrees Kelvin.

E.8. Refractive Modulus and Refractive Index

The refractive modulus or refractivity (Selby and McClatchey, 1975; Smith and Weintraub, 1953) is defined as N, where

$$N = (n - 1) \cdot 10^{6} \tag{87}$$

and n is the refractive index.

For microwave frequencies below approximately 30 GHz (equivalent to wavelengths above 1 cm), N, the refractive modulus, is given by the empirical equation

$$N = 77.6 \frac{P}{T_d} + 3.73 \times 10^5 \frac{e}{T^2} \text{ (dimensionless)}, \tag{88}$$

where E and P are in millibars and T and T_d are in degrees Kelvin.

The following expression is valid for the visible and infrared wavelengths shorter than approximately 30 μm (0.03 mm).

$$N = 77.6 \frac{P}{T} + 0.584 \frac{P}{T\lambda} \text{ (dimensionless)}, \tag{89}$$

where λ is the wavelength in microns and T is in degrees Kelvin.

The expression for N for the wavelength from 0.03 mm to 1 cm is an extremely complex function of wavelength.

CHAPTER IV. CONCLUSIONS AND RECOMMENDATIONS

Conclusions

This document satisfies the technical objectives established for the RRAC by the RCC MG. Upper air statistics and models for wind and thermodynamic quantities for the specific site have been derived in a consistent and uniform manner, which will be used in publications for all other assigned site locations. These RRAs represent an improvement over the previously published RRAs because of the availability of more extensive upper air data bases and the adaptation of more advanced statistical techniques. A statistical measure of central tendency (mean values) and a measure of dispersion (standard deviation with respect to the mean values) for monthly and annual reference periods have been tabulated for all variables in a consistent manner from data bases that have been edited and quality-controlled in the same manner. Further, a statistical measure for symmetry (skewness coefficient that involves the third statistical moment) has been tabulated for all variables except the U and V wind components. Even with these improvements, the user of these RRAs must recognize certain limitations of the statistical tabulations:

1) The wind profile structure with respect to altitude cannot be modeled from the RRA statistics because the interlevel and crosslevel correlations were not computed.

2) The profile structure with respect to altitude for any of the thermodynamic variables or any quantities derivable from these variables cannot be modeled because the prerequisite correlations were not computed. However, the profiles of monthly and annual means for pressure, virtual temperature, and density are in agreement (table IV) with the hydrostatic equation and the equation of state.

The preceding limitations are cited to prevent a misuse of the RRAs. More extensive statistical tabulations were beyond the scope of this committee's task. As greater insight is gained through usage of these RRAs, many adaptations of the statistical tabulations for specific engineering and scientific applications are envisioned.

Recommendations

It is recommended than the wind and thermodynamic statistical tabulations and attendant models contained in the RRAs be used as a standard reference source, as may be appropriate, by the ranges and range users. It is further recommended that the respective Range Staff Meteorologist or responsible agency staff member be consulted for the applicability of the RRAs for specific engineering applications.

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In addition to the documents above and the present RRA for Michael AAF, Dugway, Utah, the revised series will include RRAs for the following locations:

Edwards AFB, California
White Sands Missile Range, New Mexico
Point Mugu, California

Eglin AFB, Florida
Ascension Island, South Atlantic
Wallops Island, Virginia
Taquac (Guam)
Barking Sands, Hawaii

CONVERSION UNITS

Physical Constants and Conversion Factors

Numerical values in this document are given in the International System of Units (SI, Système International d'Unités). The values in parentheses are equivalent U.S. Customary Units, which are English units adapted for use by the United States of America. The SI and U.S. Customary Units provided in table F are those normally used for measuring and reporting atmospheric data.

By definition, the following fundamental conversion factors are exact:

Type	U.S. Customary Units	Metric
Length	1 U.S. yard (yd)	0.9144 meter (m)
Mass	1 avoirdupois pound (lb)	453.59237 gram (g)
Time	1 second (s)	1 second (s)
Temperature	1 degree Rankine (°R)	9/5 degree Kelvin (K)

To aid in the conversion of units, conversion factors based on the above fundamental conversion factors are given in table F.

TABLE F. FACTORS FOR CONVERSION UNITS

Type of Data	METRIC Unit	METRIC Abbreviation	U.S. CUSTOMARY Unit	U.S. CUSTOMARY Abbreviation	CONVERSION Multiply	CONVERSION By	CONVERSION To Get
TEMPERATURE							
Ambient Temperature	degree Celsius	C	degree Fahrenheit	F	F − 32	0.5556	C
	degree Kelvin	K	degree Rankine	R	C	1.8*	F − 32
					R	1.00*	F + 459.67
					R − 459.67	1.00*	F
					K	1.00*	C + 273.15
					K − 273.15	1.00*	C
Temperature Change	degree Celsius	C	degree Fahrenheit	F	C or K	1.8*	temp. change F or R
	degree Kelvin	K	degree Rankine	R	F or R	0.5556	temp. change C or K
DENSITY							
Water Vapor Vapor Concentration (Absolute Humidity) and Ambient Density	gram per cubic meter	$g\ m^{-3}$	grain per cubic foot	$gr\ ft^{-3}$	$g\ m^{-3}$	0.43700	$gr\ ft^{-3}$
	gram per cubic centimeter	$g\ cm^{-3}$			$gr\ ft^{-3}$	2.2883	$g\ m^{-3}$
					$g\ cm^{-3}$	10^{6}*	$g\ m^{-3}$
					$g\ cm^{-3}$	4.370×10^{5}	$gr\ ft^{-3}$
					$gr\ ft^{-3}$	2.288×10^{-6}	$g\ cm^{-3}$
WIND							
Windspeed	meter per second	$m\ s^{-1}$	mile per hour	mph	$m\ s^{-1}$	2.2369	mph
			knots	knots	mph	0.44704	$m\ s^{-1}$
			feet per second	$ft\ s^{-1}$	$m\ s^{-1}$	1.9438	knots
					knots	0.51444	$m\ s^{-1}$
					mph	0.86898	knots
					knots	1.15078	mph
					$m\ s^{-1}$	3.2808	$ft\ s^{-1}$
					$ft\ s^{-1}$	0.3048*	$m\ s^{-1}$
DISTANCE							
Length	meter	m	feet	ft	m	3.2808	ft
	micron	µ	inch	in	ft	0.3048*	m
	Angstrom	Å			in	2.54×10^{4}*	µ
					in	2.54×10^{8}*	Å
						[illegible]	µ
						[illegible]	Å

* Denotes exact conversion factor

TABLE F. (continued)

Type of Data	METRIC Unit	METRIC Abbreviation	U.S. CUSTOMARY Unit	U.S. CUSTOMARY Abbreviation	CONVERSION Multiply	CONVERSION By	CONVERSION To Get
DISTANCE (Concluded)					μ	10^{-6}*	m
					μ	[illegible] × $10^{[illegible]}$	in
					Å	$10^{[illegible]}$	[illegible]
					Å	[illegible] × 10^{-9}	in
MASS							
Weight	gram	[illegible]	[illegible]		lb	0.45359237	kg
	kilogram	kg	pound	lb	lb	453.59237	g
					kg	2.20462	lb
					g	15.4324	gr
					gr	0.06480	g
PRESSURE							
Atmospheric	newton per square meter	newton m^{-2}	pound (force) per square inch	lb in^{-2}	mb	10^{-3}*	bar
					bar	10^{3}*	mb
	millimeter of Mercury	mmHg	inch of Mercury	in Hg	newton m^{-2}	10^{-2}	mb
					newton m^{-2}	1.4504 × 10^{-4}	lb in^{-2}
					lb in^{-2}	6.8948 × 10^{3}	[illegible]
	bar	bar			mb	1.4504 × $10^{[illegible]}$	[illegible]
	millibar	mb			lb in^{-2}	68.948	[illegible]
	dyne per square centimeter [illegible]	dyne cm^{-2}			mb	10^{3}	[illegible]
					dyne cm^{-2}	$10^{[illegible]}$	mb
	kilogram [illegible] per square meter	kg m^{-2}			lb in^{-2}	6.8948 × $10^{[illegible]}$	[illegible]
					dyne cm^{-2}	1.4504 × $10^{[illegible]}$	[illegible]
					[illegible]	[illegible]	[illegible]
					kg m^{-2}	0.0980665	[illegible]
					lb in^{-2}	703.0696	[illegible]
					kg m^{-2}	0.0014223	[illegible]
					mb	2.95[illegible] × $10^{[illegible]}$	in Hg [illegible]
					[illegible]	[illegible]006	[illegible]
					in Hg [illegible]	25.4	mm Hg [illegible]
					[illegible]	[illegible]	[illegible]
					[illegible]	[illegible]	[illegible]
	[illegible]	Pa			Pa	1.00	newton m^{-2}

* [illegible]

TABLE 1. 1 WIND STATISTICAL PARAMETERS, JANUARY
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	MEAN U M/S	S.D. U M/S	R(U,V)	MEAN V M/S	S.D. V M/S	MEAN WS M/S	S.D. WS M/S	SKEW WS	NOBS
1.288	-.11	2.09	-.4764	.96	3.84	3.75	2.45	1.08	1192.
2.000	1.68	2.73	-.2615	2.71	6.37	6.04	4.66	1.28	1190.
3.000	6.35	4.81	0956	-.91	6.08	9.17	4.15	.55	1188.
4.000	9.61	6.68	.2463	-3.52	8.10	13.62	5.42	.23	1167.
5.000	12.76	8.74	.2242	-4.91	10.63	17.90	7.46	.20	1187.
6.000	15.52	11.01	.2303	-6.05	13.30	21.92	9.74	.36	1187.
7.000	17.43	13.13	.2378	-6.94	15.62	25.21	11.53	.46	1179.
8.000	18.90	14.91	.2687	-7.74	17.64	27.95	13.02	.44	1152.
9.000	20.28	16.47	.3093	-8.47	19.16	30.39	14.04	.40	1131.
10.000	21.38	16.97	.3043	-9.00	19.10	31.35	14.41	.43	1101.
11.000	22.14	15.98	.2647	-8.63	17.31	30.41	13.94	.52	1083.
12.000	22.27	13.93	.2173	-7.71	14.87	28.47	12.63	.65	1076.
13.000	21.34	11.01	.2107	-6.60	12.36	25.88	10.14	.58	1064.
14.000	19.81	9.10	.2109	-5.82	10.68	23.50	8.41	.34	1060.
15.000	18.24	8.02	.2056	[illegible]	[illegible]	21.34	7.39	.29	1052.
16.000	16.45	7.65	.1318	-4.83	8.12	19.17	7.15	.36	1051.
17.000	13.99	7.06	.0837	-4.45	6.89	16.40	6.62	.64	1035.
18.000	11.07	6.72	.0643	-4.12	5.70	[illegible]	6.26	.98	1027.
19.000	8.49	6.51	.0560	-4.02	4.91	10.96	5.88	1.11	1020.
20.000	6.46	6.71	.0150	-3.97	4.38	9.41	5.76	1.11	1019.
21.000	4.99	7.35	.0158	-4.13	4.13	8.91	5.78	1.19	1001.
22.000	3.74	8.39	.0084	-4.30	4.19	9.13	6.08	1.36	955.
23.000	3.06	9.37	.0400	-4.54	4.23	9.75	6.37	1.46	940.
24.000	2.28	10.23	.1546	-4.69	4.67	10.52	6.54	1.36	887.
25.000	1.79	11.28	.2598	-4.84	5.13	11.43	7.02	1.29	821.
26.000	1.66	12.42	.3375	-5.11	5.75	12.56	7.64	1.21	804.
27.000	1.71	13.87	.3870	-5.35	6.23	13.89	8.36	1.20	636.
28.000	1.15	14.48	.4028	-5.64	7.23	14.72	8.83	1.21	573.
29.000	2.04	17.54	.4669	-4.67	8.64	17.16	10.62	1.18	280.
30.000	2.54	18.10	.4269	-4.99	9.14	17.61	11.45	1.18	244.

TABLE 1. 2 WIND STATISTICAL PARAMETERS, FEBRUARY
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	MEAN U M/S	S.D. U M/S	R(U,V)	MEAN V M/S	S.D. V M/S	MEAN WS M/S	S.D. WS M/S	SKEW WS	NOBS
1.288	.06	2.17	-.4813	.58	4.02	3.98	2.31	1.44	1118.
2.000	1.56	2.80	-.3462	1.89	6.19	5.84	4.25	1.21	1120.
3.000	5.31	4.60	.0497	-.86	6.29	8.50	4.16	.77	1119.
4.000	7.89	6.42	.1989	-2.91	8.06	12.14	5.43	.45	1118.
5.000	10.34	8.47	.2218	-4.33	10.54	15.90	7.44	.43	1118.
6.000	12.34	10.40	.2414	-5.17	13.03	19.23	9.33	.47	1114.
7.000	14.20	12.18	.2488	-6.13	15.46	22.45	11.06	.49	1114.
8.000	15.52	13.79	.2550	-7.24	17.36	25.14	12.34	.51	1098.
9.000	17.01	15.09	.2782	-8.21	18.69	27.47	13.36	.54	1087.
10.000	18.81	15.17	.2841	-8.30	17.98	28.35	13.12	.48	1065.
11.000	20.11	14.33	.2559	-8.00	16.00	27.81	12.51	.46	[illegible]
12.000	20.51	12.25	.2302	-6.98	13.28	26.01	10.93	.54	1036.
13.000	19.81	9.82	.2418	-5.92	11.15	23.77	9.11	.57	1028.
14.000	18.72	8.50	.2399	-5.27	9.87	21.99	8.00	.35	1026.
15.000	17.13	7.64	.2380	-4.74	8.71	19.95	7.21	.28	1024.
16.000	15.03	6.38	.1845	-4.21	7.37	17.38	6.65	.40	1018.
17.000	12.35	6.12	.1435	-3.79	5.98	14.33	5.88	.54	1007.
18.000	9.74	5.70	.1061	-3.42	5.06	11.63	5.43	.77	1009.
19.000	7.33	5.36	.0900	-3.15	4.38	9.30	5.02	.95	1004.
20.000	5.41	5.35	.0323	-3.13	3.78	7.74	4.70	1.22	997.
21.000	3.92	5.61	.0263	-3.29	3.49	7.04	4.49	1.42	980.
22.000	2.55	6.11	-.0180	-3.53	3.52	6.98	4.46	1.48	942.
23.000	1.60	6.28	-.0017	-3.67	3.38	6.90	4.37	1.44	929.
24.000	.88	7.07	-.0168	-3.78	3.65	7.48	4.73	1.45	898.
25.000	.48	8.02	-.0179	-3.99	3.95	8.27	5.24	1.42	838.
26.000	.48	8.71	.0034	-3.92	4.06	8.75	5.60	1.39	806.
27.000	.67	9.66	.1071	-4.00	4.20	9.55	6.00	1.30	653.
28.000	.61	10.62	.1472	-4.22	4.84	10.52	6.44	1.23	610.
29.000	2.94	12.68	.2050	-4.40	5.59	12.74	7.58	1.27	317.
30.000	4.02	14.39	.1973	-4.44	6.26	14.39	8.63	1.33	295.

TABLE 1. 3 WIND STATISTICAL PARAMETERS, MARCH
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	MEAN U M/S	S.D. U M/S	R(U,V)	MEAN V M/S	S.D. V M/S	MEAN WS M/S	S.D. WS M/S	SKEW WS	NOBS
1.288	.25	2.57	-.4279	.61	4.57	4.62	2.57	1.38	1218.
2.000	1.69	2.97	-.3337	1.29	6.48	6.03	4.36	1.35	1213.
3.000	4.75	4.50	.0755	.31	6.33	8.12	4.11	.82	1212.
4.000	7.45	6.32	.1639	-.83	7.57	11.26	5.17	.35	1212.
5.000	9.64	8.33	.1767	-1.43	9.61	14.36	7.10	.39	1211.
6.000	11.73	10.47	.1670	-1.97	11.99	17.65	9.12	.50	1213.
7.000	13.40	12.63	1537	-2.33	14.34	20.74	10.95	.56	1208.
8.000	14.44	14.39	.1773	-2.98	16.29	23.18	12.34	.59	1192.
9.000	15.99	15.59	.2295	-3.40	17.79	25.38	13.52	.52	1180.
10.000	17.93	15.72	.2554	-3.77	17.84	26.46	14.12	.56	1160.
11.000	19.16	14.49	.2593	-3.56	15.66	25.66	13.27	.57	1139.
12.000	19.28	12.35	.2096	-2.84	12.84	23.72	11.59	.71	1126.
13.000	18.33	9.78	.1942	-1.97	10.31	21.36	9.25	.70	1122.
14.000	17.05	8.14	.2007	-1.50	8.81	19.42	7.72	.44	1114.
15.000	15.64	7.22	.1760	-1.16	7.69	17.57	6.96	.30	1112.
16.000	13.73	6.62	.1145	-1.02	6.71	15.39	6.46	.43	1110.
17.000	11.37	5.75	.0836	-.92	5.48	12.73	5.59	.70	1110.
18.000	9.01	5.21	.0767	-.82	4.62	10.29	4.94	.87	1110.
19.000	6.95	5.07	.0571	-.85	3.96	8.29	4.65	1.10	1102.
20.000	5.13	5.22	.1063	-.92	3.49	6.86	4.41	1.30	1094.
21.000	3.73	5.64	.1484	-1.01	3.09	6.21	4.22	1.62	1065.
22.000	2.46	6.17	.1370	-1.26	3.04	6.17	4.10	1.60	1031.
23.000	1.79	6.66	.1940	-1.41	2.69	6.32	4.09	1.53	1015.
24.000	1.24	7.56	.2657	-1.55	2.83	7.00	4.48	1.44	977.
25.000	.90	8.76	.3421	-1.64	3.02	7.91	5.16	1.22	912.
26.000	1.15	10.07	.3875	-1.65	3.09	8.99	5.84	1.08	863.
27.000	1.39	11.05	.3951	-1.84	3.28	9.78	6.51	1.13	664.
28.000	1.86	12.30	.4142	-1.91	3.80	10.80	7.37	1.20	646.
29.000	2.18	12.39	.5406	-1.91	4.57	11.19	7.56	1.00	351.
30.000	3.29	13.90	.5353	-2.10	5.22	12.68	8.63	.85	325.

TABLE 1. 4 WIND STATISTICAL PARAMETERS, APRIL
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	MEAN U M/S	S.D. U M/S	R(U,V)	MEAN V M/S	S.D. V M/S	MEAN WS M/S	S.D. WS M/S	SKEW WS	NOBS
1.288	.30	2.80	-.3441	.40	4.64	4.69	2.76	2.32	1198.
2.000	1.64	3.19	-.3201	1.28	6.60	6.19	4.44	1.18	1197.
3.000	4.07	4.12	-.0709	1.48	6.96	8.02	4.44	1.17	1196.
4.000	6.50	5.63	.0620	1.53	8.42	10.97	5.18	.47	1196.
5.000	8.44	7.23	.1180	1.60	10.77	13.94	6.89	.43	1197.
6.000	10.29	9.13	.1188	1.70	12.73	16.85	8.38	.43	1194.
7.000	12.14	11.23	.1370	1.77	14.92	20.02	9.91	.42	1169.
8.000	13.64	13.00	.1940	1.97	17.24	22.87	11.53	.45	1177.
9.000	15.36	14.37	.2373	1.97	19.04	25.37	12.85	.53	1169.
10.000	16.92	14.20	.2405	1.50	19.32	26.26	13.14	.41	1150.
11.000	17.81	13.06	.2396	1.04	17.70	25.47	12.37	.37	[illegible]
12.000	17.76	11.52	..905	1.09	14.70	23.36	10.95	.46	1126.
13.000	16.61	9.56	.1307	1.51	11.81	20.66	9.06	.43	1121.
14.000	15.16	8.06	.0855	2.01	9.91	18.37	7.72	.31	1116.
15.000	13.74	7.18	.0801	2.27	8.70	16.50	6.97	.20	1109.
16.000	11.84	6.54	.0255	2.18	7.30	14.19	6.28	.40	1108.
17.000	9.62	5.60	-.0001	2.04	6.13	11.60	5.39	.43	1107.
18.000	7.35	5.04	-.0028	1.75	5.19	9.29	4.81	.56	1110.
19.000	5.39	4.57	.0427	1.15	4.21	7.17	4.20	.76	1112.
20.000	3.59	4.39	.0487	.60	3.49	5.62	3.61	1.09	1102.
21.000	2.40	4.57	.1435	.27	3.05	5.03	3.28	1.25	1076.
22.000	1.75	5.17	.2342	.00	2.86	5.10	3.45	1.50	1056.
23.000	1.68	5.73	.3410	-.17	2.54	5.21	3.86	1.49	1020.
24.000	1.60	6.61	.3555	-.34	2.81	5.89	4.42	1.45	979.
25.000	1.86	7.53	.3976	-.52	2.93	6.57	5.07	1.39	961.
26.000	2.48	8.50	.4396	-.50	3.02	7.37	5.79	1.27	901.
27.000	3.33	9.51	.4331	-.63	3.18	8.28	6.58	1.31	748.
28.000	4.36	10.63	.4274	-.63	3.52	9.39	7.52	1.34	737.
29.000	5.28	10.67	.3851	-.51	3.65	9.64	7.90	1.58	433.
30.000	6.80	11.58	.3622	-.30	4.18	10.80	9.01	1.48	409.

TABLE I. 5 WIND STATISTICAL PARAMETERS. MAY
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	MEAN U M/S	S.D. U M/S	R(U,V)	MEAN V M/S	S.D. V M/S	MEAN WS M/S	S.D. WS M/S	SKEW WS	NOBS
1.288	-.05	2.45	-.3869	.23	4.21	4.39	2.13	1.37	1239.
2.000	1.19	2.70	-.2393	1.07	5.75	5.36	3.76	1.34	1236.
3.000	3.42	4.00	.0332	1.60	5.81	6.89	4.06	1.22	1235.
4.000	5.70	5.45	.0490	2.30	7.06	9.66	4.90	.70	1233.
5.000	7.39	7.22	.0581	2.95	8.83	12.28	6.53	.78	1234.
6.000	8.93	8.66	.0727	3.17	10.30	14.32	8.09	.90	1234.
7.000	10.21	9.97	.0722	3.22	11.84	16.32	9.37	.90	1234.
8.000	11.18	11.26	.0693	3.20	13.62	18.41	10.42	.85	1227.
9.000	12.20	12.30	.1025	3.12	14.89	20.18	11.12	.76	1219.
10.000	13.13	12.83	.1031	2.78	15.57	21.36	11.43	.71	1201.
11.000	13.90	12.42	.0946	2.42	15.17	21.41	11.17	.61	1188.
12.000	14.31	11.27	.0852	2.23	13.61	20.42	10.25	.54	1184.
13.000	13.62	9.41	.0327	2.18	10.78	17.98	8.45	.69	1177.
14.000	12.27	7.53	-.0093	2.35	8.56	15.47	6.82	.47	1175.
15.000	10.72	6.02	-.0740	2.33	7.17	13.33	5.81	.51	1175
16.000	8.84	5.51	-.0995	2.12	5.91	11.15	4.86	.69	1176.
17.000	6.86	4.66	-.1508	1.75	4.70	8.86	3.94	.71	1173.
18.000	4.66	4.15	-.1817	1.14	3.87	6.58	3.45	.92	1174.
19.000	2.72	3.58	-.1995	.41	3.19	4.77	2.80	1.32	1174.
20.000	1.04	3.21	-.2085	-.08	2.77	3.71	2.29	1.77	1161.
21.000	-.14	3.10	-.1876	-.36	2.47	3.40	2.08	1.73	1141.
22.000	-1.00	3.03	-.1596	-.56	2.31	3.43	2.01	1.24	1138.
23.000	-1.42	3.05	-.0625	-.68	1.99	3.43	2.00	.95	1101.
24.000	-1.71	3.49	.0734	-.72	2.15	3.88	2.27	1.00	1089.
25.000	-1.61	3.86	.0918	-.81	2.13	4.12	2.39	1.33	1053.
26.000	-1.34	4.18	.1243	-.88	2.13	4.28	2.49	1.31	951.
27.000	-1.15	4.54	.1771	-.78	2.29	4.59	2.58	1.09	796.
28.000	-.97	4.91	.1778	-.60	2.38	4.86	2.73	1.18	772.
29.000	-1.05	5.05	.1072	-.57	2.53	5.08	2.72	.63	452.
30.000	-.67	5.32	.1013	-.37	2.49	5.15	2.92	.76	426.

TABLE I. 6 WIND STATISTICAL PARAMETERS. JUNE
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	MEAN U M/S	S.D. U M/S	R(U,V)	MEAN V M/S	S.D. V M/S	MEAN WS M/S	S.D. WS M/S	SKEW WS	NOBS
1.288	-.21	2.34	-.3358	.30	4.22	4.39	2.03	1.27	1191.
2.000	.76	2.60	-.2721	1.09	5.73	5.32	3.60	1.11	1189.
3.000	3.30	3.55	.0178	2.06	5.22	6.48	3.60	.92	1189.
4.000	5.83	4.86	-.0619	3.19	6.48	9.48	4.46	.56	1189.
5.000	7.65	6.37	-.0452	4.24	8.17	12.21	5.87	.60	1187.
6.000	9.13	7.39	.0313	4.45	9.25	13.94	7.00	.60	1186.
7.000	10.57	8.55	.0996	4.49	10.42	15.71	8.18	.72	1185
8.000	11.89	9.78	.1152	4.53	11.82	17.57	9.40	.80	1184.
9.000	13.07	10.93	.1181	4.63	13.20	19.42	10.42	.76	1183.
10.000	14.47	11.99	.1550	4.90	14.26	21.26	11.33	.70	1173.
11.000	15.60	12.35	.2005	5.01	14.51	22.31	11.56	.53	1170.
12.000	16.44	12.10	.2082	4.75	13.69	22.42	11.13	.50	1168.
13.000	15.82	10.90	.2028	4.56	11.85	20.84	9.79	.51	1164.
14.000	13.83	8.83	.1541	4.16	9.49	17.74	7.86	.47	1158.
15.000	11.12	6.65	.0524	3.72	7.53	14.25	5.93	.29	1157.
16.000	7.96	4.92	-.0317	2.95	5.79	10.60	4.18	.17	1157.
17.000	4.74	3.74	-.0689	2.05	4.30	7.09	2.97	.20	1151
18.000	1.83	3.08	-.0407	1.18	3.33	4.52	2.20	.53	1149
19.000	-.42	2.63	.0118	.61	2.61	3.38	1.68	.62	1143.
20.000	-2.26	2.41	.0073	.17	2.12	3.51	1.77	.55	1134.
21.000	-3.69	2.45	.0761	-.21	1.94	4.37	2.08	.40	1116.
22.000	-4.70	2.37	.0715	-.41	1.62	5.09	2.14	.10	1110.
23.000	-5.57	2.38	.0348	-.54	1.50	5.85	2.23	-.06	1061.
24.000	-6.31	2.65	.0200	-.63	1.64	6.62	2.47	-.01	1061.
25.000	-6.96	2.85	-.0362	-.72	1.60	7.25	2.66	.02	1009.
26.000	-7.67	2.95	-.0287	-.73	1.60	7.92	2.80	-.01	917.
27.000	-8.38	3.20	.0573	-.57	1.98	8.69	3.02	-.05	800.
28.000	-8.84	3.32	.1165	-.44	1.73	9.09	3.13	-.16	732.
29.000	-9.53	3.72	.1520	-.43	2.02	9.84	3.48	-.08	481.
30.000	-10.17	3.57	.1814	-.45	1.78	10.40	3.35	-.33	386.

TABLE 1. 7 WIND STATISTICAL PARAMETERS, JULY
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	MEAN U M/S	S.D. U M/S	R(U,V)	MEAN V M/S	S.D. V M/S	MEAN WS M/S	S.D. WS M/S	SKEW WS	NOBS
1.288	-.40	2.33	-.3544	.73	4.22	4.49	1.94	1.12	1243.
2.000	.38	2.39	-.2197	1.97	5.61	5.33	3.57	1.12	1238.
3.000	2.71	2.93	.1312	1.99	4.13	5.23	3.09	1.01	1238.
4.000	4.81	3.83	.1177	2.75	4.73	7.33	3.73	.47	1237.
5.000	6.47	4.77	.0816	3.67	5.95	9.53	4.76	.49	1238.
6.000	7.97	5.20	.1563	4.18	6.47	10.96	5.45	.41	1239.
7.000	9.62	5.68	.1695	4.64	6.93	12.58	6.01	.44	1237.
8.000	11.32	6.31	.1316	5.48	7.67	14.57	6.67	.46	1237.
9.000	13.26	7.05	.0875	6.39	8.59	16.91	7.37	.40	1238.
10.000	15.48	7.91	.0474	7.46	9.67	19.66	8.07	.19	1235.
11.000	17.89	8.86	.0637	8.58	10.79	22.55	8.94	.07	1234.
12.000	19.49	9.01	.0645	8.93	11.29	24.20	9.09	.05	1232.
13.000	19.49	8.70	.0997	8.44	10.77	23.76	8.83	.02	1226.
14.000	16.55	7.46	.1024	7.04	9.28	20.25	7.41	.04	1220.
15.000	12.39	5.32	.0744	5.46	7.59	15.56	5.78	.03	1217.
16.000	7.96	4.66	.1055	3.96	5.90	10.74	4.51	.30	1214.
17.000	3.91	3.71	.1055	2.54	4.43	6.64	3.31	.59	1212.
18.000	.65	3.10	.1455	1.37	3.55	4.35	2.38	.85	1212.
19.000	-2.13	2.62	.1521	.51	2.67	3.85	1.99	.74	1196.
20.000	-4.33	2.35	.1236	.06	2.20	4.99	2.06	.56	1166.
21.000	-5.90	2.23	.1191	-.23	2.01	6.27	2.14	.32	1174.
22.000	-7.14	1.92	.1023	-.32	1.56	7.32	1.90	.00	1155.
23.000	-8.33	2.01	.0886	-.39	1.48	8.48	1.98	.09	1116.
24.000	-9.42	2.22	.0335	-.46	1.51	9.56	2.20	.11	1114.
25.000	-10.31	2.30	.0264	-.47	1.54	10.44	2.26	.05	1057.
26.000	-11.23	2.40	.0392	-.52	1.59	11.36	2.37	.04	960.
27.000	-12.05	2.76	.0876	-.50	1.86	12.21	2.72	-.02	919.
28.000	-12.99	2.60	.1226	-.48	1.51	13.09	2.58	-.04	739.
29.000	-13.84	2.95	.0983	-.37	1.98	14.00	2.91	-.09	622.
30.000	-14.84	2.84	.1464	-.53	1.69	14.95	2.83	-.13	408.

TABLE 1. 8 WIND STATISTICAL PARAMETERS, AUGUST
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	MEAN U M/S	S.D. U M/S	R(U,V)	MEAN V M/S	S.D. V M/S	MEAN WS M/S	S.D. WS M/S	SKEW WS	NOBS
1.288	-.47	2.25	-.3744	.73	4.24	4.49	1.88	1.12	1236
2.000	.67	2.27	-.2684	1.72	5.63	5.20	3.63	1.27	1234.
3.000	3.09	3.15	.0955	1.99	4.41	5.57	3.45	1.14	1234
4.000	5.10	4.31	.0803	2.66	5.31	7.91	4.15	.66	1232.
5.000	6.83	5.63	.0951	3.42	6.61	10.18	5.49	.68	1232.
6.000	8.36	6.40	.1216	3.72	7.42	11.72	6.51	.74	1233.
7.000	9.99	7.22	.1161	3.90	8.16	13.38	7.39	.87	1232.
8.000	11.64	7.98	.0968	4.17	9.02	15.19	8.20	.92	1233.
9.000	13.38	8.74	.0615	4.83	9.98	17.35	8.79	.80	1229.
10.000	15.43	9.63	.0258	5.74	11.09	19.95	9.43	.58	1223.
11.000	17.66	10.28	.0317	6.50	12.22	22.59	9.94	.45	1213.
12.000	19.18	10.44	.0394	6.59	12.59	24.03	10.06	.32	1209.
13.000	18.96	9.90	.0681	5.96	11.55	23.23	9.31	.26	1206.
14.000	16.54	8.44	.0425	5.03	9.80	20.13	7.80	.32	1203.
15.000	12.69	6.49	.0452	3.99	7.75	15.58	6.02	.27	1196.
16.000	8.47	4.93	.0927	2.75	5.74	10.76	4.57	.50	1189.
17.000	4.59	3.77	.1351	1.64	4.14	6.65	3.30	.75	1183.
18.000	1.62	3.14	.1413	.69	3.20	4.24	2.28	.89	1180.
19.000	-.61	2.84	.1783	.09	2.48	3.39	1.77	.72	1170.
20.000	-2.37	2.73	.1777	-.25	2.02	3.66	1.95	.78	1162.
21.000	-3.74	2.69	.1506	-.45	1.84	4.48	2.19	.48	1155.
22.000	-4.94	2.56	.0852	-.53	1.49	5.32	2.25	.11	1143
23.000	-6.05	2.63	.0564	-.53	1.46	6.31	2.46	-.07	1101.
24.000	-7.02	2.80	.0157	-.53	1.53	7.26	2.65	-.12	1095.
25.000	-7.88	2.91	.0375	-.54	1.47	8.06	2.84	-.17	1045.
26.000	-8.59	3.01	.0427	-.62	1.47	8.76	2.93	-.10	949.
27.000	-9.34	3.33	.0144	-.64	1.79	9.56	3.26	-.12	916.
28.000	-9.96	3.19	.0745	-.62	1.54	10.12	3.13	-.08	775.
29.000	-10.62	3.60	.0814	-.55	2.09	10.90	3.40	.11	605.
30.000	-11.40	3.49	.0626	-.53	1.79	11.57	3.43	-.07	423.

TABLE I. 9 WIND STATISTICAL PARAMETERS, SEPTEMBER
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	MEAN U M/S	S.D. U M/S	R(U,V)	MEAN V M/S	S.D. V M/S	MEAN WS M/S	S.D. WS M/S	SKEW WS	NOBS
1.288	-.24	2.41	-.3917	.58	4.17	4.41	2.04	1.41	1197.
2.000	.99	2.47	-.2213	1.70	5.76	5.29	3.88	1.27	1194.
3.000	3.55	3.65	.0720	2.00	5.03	6.36	3.84	.95	119[illegible].
4.000	5.69	5.16	.0420	2.22	6.42	9.10	4.73	.66	1192.
5.000	7.53	6.79	.1132	2.24	8.09	11.56	6.30	.53	1[illegible]2.
6.000	9.10	8.39	.1798	1.95	9.46	13.65	7.75	.72	119[illegible].
7.000	10.60	9.92	.2255	1.79	10.85	15.78	9.08	.86	119[illegible]
8.000	11.92	11.17	.2300	1.74	12.19	17.82	10.05	.85	119[illegible].
9.000	13.26	12.51	.2291	1.68	13.29	19.76	11.01	.84	1195.
10.000	14.92	13.53	.2438	1.97	14.23	21.8[illegible]	11.66	.67	1172.
11.000	16.81	13.99	.2534	2.23	14.57	23.51	11.95	.46	1153.
12.000	18.29	13.35	.2645	2.14	13.82	23.95	11.57	.32	1155.
13.000	18.22	11.67	.2543	2.00	12.19	22.62	10.43	.35	1146
14.000	16.74	9.64	.2418	1.71	10.00	20.04	8.61	.24	1140.
15.000	14.[illegible]6	7.57	[illegible]	1.47	[illegible]	[illegible]	5.8[illegible]	[illegible]	[illegible]
16.000	11.32	6.18	.2008	1.07	6.65	13.41	5.64	.30	1131.
17.000	8.19	4.96	.1303	.50	5.09	9.87	4.52	.50	1126.
18.000	5.09	4.14	.1377	-.04	4.00	6.81	3.56	.72	112[illegible].
19.000	2.94	3.52	.1637	-.42	3.24	4.97	2.65	.74	1123.
20.000	1.50	3.37	.1979	-.55	2.80	4.0[illegible]	2.26	1.15	1118.
21.000	.67	3.38	.2030	-.56	2.59	3.77	2.17	1.13	1103.
22.000	.21	3.34	.1849	-.64	2.22	3.54	2.01	1.15	1102.
23.000	-.05	3.38	.1774	-.66	1.97	3.45	1.95	1.16	1068.
24.000	-.15	3.77	.1362	-.61	2.03	3.73	2.19	1.19	1065.
25.000	-.15	4.03	.1339	-.57	1.94	3.91	2.24	1.03	1030.
26.000	-.08	4.31	.1847	-.45	1.87	4.09	2.37	1.01	939.
27.000	-.10	4.76	.2093	-.44	2.15	4.53	2.65	.88	616
28.000	.14	5.04	.2764	-.36	2.01	4.61	2.89	1.07	777.
29.000	-.24	5.60	.2449	-.34	2.19	5.13	3.16	1.26	480.
30.000	.18	5.96	.3663	-.22	2.08	5.29	3.45	1.21	[illegible]

TABLE I. 10 WIND STATISTICAL PARAMETERS, OCTOBER
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	MEAN U M/S	S.D. U M/S	R(U,V)	MEAN V M/S	S.D. V M/S	MEAN WS M/S	S.D. WS M/S	SKEW WS	NOBS
1.288	-.05	2.22	-.4811	.17	4.00	4.11	2.01	1.65	1234.
2.000	1.11	2.38	-.2172	1.29	5.83	5.09	4.07	1.57	1229.
3.000	3.37	4.29	.0735	.81	5.80	6.90	4.06	1.12	1227.
4.000	5.61	6.18	.1540	.09	7.34	9.90	5.05	.65	1225.
5.000	7.59	7.91	.1850	-.38	9.39	12.76	6.76	.52	1227.
6.000	9.34	9.81	.2015	-.54	11.41	15.49	8.60	.53	1231.
7.000	10.66	11.51	.2175	-.68	13.26	17.95	10.01	.60	1229.
8.000	11.52	12.95	.2321	-.92	15.00	20.00	11.23	.69	1225.
9.000	12.45	14.24	.2767	-1.17	16.51	22.01	12.12	.74	1218.
10.000	13.46	14.95	.3045	-1.52	17.20	23.41	12.43	.55	1196.
11.000	14.64	15.11	.3214	-1.66	17.06	24.[illegible]	12.28	[illegible]	[illegible]
12.000	15.39	14.33	.3181	-1.77	15.65	23.60	11.53	.36	1180.
13.000	15.42	12.58	.2686	-1.43	13.56	21.81	10.30	.31	1171.
14.000	14.66	10.55	.2403	-1.23	11.62	19.52	9.05	.32	1159.
15.000	13.29	8.62	.2469	-1.05	9.73	17.01	7.59	.23	1153.
16.000	11.44	7.02	.2183	-1.18	7.76	14.24	6.25	.28	1149.
17.000	9.13	5.63	.1704	-1.26	6.13	11.37	5.00	.35	1141.
18.000	6.83	4.68	.1222	-1.30	5.01	8.68	4.06	.51	1144.
19.000	5.05	4.01	.1739	-1.37	4.14	7.05	3.31	.60	1142.
20.000	3.88	3.77	.2359	-1.32	3.50	5.83	3.04	.94	1134
21.000	3.34	3.70	.2298	-1.20	3.23	5.33	2.88	1.09	1108.
22.000	3.23	3.71	.2185	-1.19	3.03	5.18	2.81	.94	1104.
23.000	3.50	3.62	.2576	-1.15	2.73	5.16	2.75	.93	1090.
24.000	3.85	4.09	.2367	-1.05	2.87	5.58	3.11	1.01	1055.
25.000	4.59	4.36	2587	-.67	2.78	6.09	3.39	1.22	1045.
26.000	5.54	4.60	.2770	-.73	2.81	6.80	3.74	1.13	942.
27.000	6.66	5.16	.3435	-.53	3.04	7.85	4.34	1.13	836.
28.000	7.83	5.72	.3570	-.46	3.11	8.94	4.90	1.10	824.
29.000	9.20	6.40	.3801	-.22	3.45	10.28	5.64	1.51	463.
30.000	10.81	7.12	.4476	-.08	3.73	11.73	6.63	1.66	421.

TABLE I. 11 WIND STATISTICAL PARAMETERS, NOVEMBER
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	MEAN U M/S	S.D. U M/S	R(U,V)	MEAN V M/S	S.D. V M/S	MEAN WS M/S	S.D. WS M/S	SKEW WS	NOBS
1.288	-.01	2.10	-.4854	.76	3.90	3.91	2.22	1.43	1193.
2.000	1.32	2.55	-.3718	2.48	6.49	5.94	4.60	1.15	1197.
3.000	4.99	4.69	.0292	.49	6.33	8.33	4.21	.72	1196.
4.000	8.22	6.45	.1268	-1.26	8.17	12.14	5.49	.39	1196.
5.000	11.09	8.65	.1030	-2.31	10.81	16.25	7.47	.43	1196.
6.000	13.68	10.67	.0937	-2.98	13.22	19.90	9.40	.46	1197.
7.000	15.83	12.60	.1079	-3.53	15.76	23.36	11.15	.48	1193.
8.000	17.35	14.06	.1565	-4.00	17.91	26.17	12.27	.47	1180.
9.000	19.43	15.65	.2192	-4.64	20.01	29.27	13.67	.48	1175.
10.000	21.17	16.64	.2553	-5.50	20.78	31.27	14.46	.50	1154.
11.000	22.41	16.60	.2409	-5.81	19.93	31.68	14.32	.47	1127.
12.000	22.83	15.33	.2371	-5.37	17.89	30.52	13.17	.42	1120.
13.000	21.65	12.91	.2496	-4.48	15.13	27.59	11.09	.34	1114.
14.000	19.91	10.43	.2311	-3.60	12.71	24.33	9.36	.21	1103.
15.000	17.79	8.61	.2300	-2.96	10.94	21.33	8.00	[illegible]	[illegible]
16.000	15.38	7.37	.1953	-2.59	9.12	18.22	6.99	.22	1101.
17.000	12.66	6.34	.1490	-2.39	7.24	14.98	6.10	.59	1086.
18.000	9.80	5.54	.1532	-2.09	5.78	11.68	5.30	.98	1090.
19.000	7.44	5.04	.1367	-2.02	4.75	9.24	4.70	1.15	1078
20.000	5.62	4.79	[illegible]	-1.94	4.08	7.53	4.28	1.33	1056.
21.000	4.22	4.99	[illegible]	-1.98	3.44	6.42	4.15	1.59	1028.
22.000	3.30	5.52	.1080	-2.09	3.43	6.24	4.31	1.76	1001.
23.000	2.95	6.08	.1427	-2.22	3.24	6.31	4.62	1.88	985.
24.000	2.56	6.87	.1629	-2.31	3.44	6.77	5.00	1.76	954.
25.000	2.39	7.66	.2191	-2.39	3.54	7.31	5.39	1.72	901.
26.000	2.73	8.62	.3002	-2.38	3.79	8.03	6.09	1.72	876.
27.000	3.28	9.78	.3474	-2.43	3.99	8.59	6.87	1.77	698.
28.000	3.72	10.52	.3631	-2.54	4.37	9.82	7.31	1.87	669.
29.000	3.26	10.54	.3152	-2.84	4.37	[illegible]	7.05	1.57	275.
30.000	4.29	11.25	.3326	-2.95	4.62	10.83	7.57	1.38	232.

TABLE I. 12 WIND STATISTICAL PARAMETERS, DECEMBER
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	MEAN U M/S	S.D. U M/S	R(U,V)	MEAN V M/S	S.D. V M/S	MEAN WS M/S	S.D. WS M/S	SKEW WS	NOBS
1.288	.09	2.01	-.4696	.81	3.71	3.60	2.35	1.95	1234.
2.000	1.59	2.76	-.3158	2.48	6.48	6.07	4.62	1.26	1231.
3.000	5.89	4.97	.0989	-.46	6.24	8.95	4.29	.79	1229.
4.000	9.23	6.94	.1825	-2.89	8.24	13.23	5.87	.47	1229.
5.000	12.12	9.15	.1325	-4.11	10.70	17.27	7.97	.35	1231.
6.000	14.58	11.20	.1503	-4.75	13.24	20.93	9.88	.36	1231.
7.000	16.34	13.15	.1823	-5.67	15.91	24.26	11.69	.38	1226.
8.000	17.98	14.83	.2286	-6.59	18.48	27.34	13.43	.46	1213.
9.000	19.76	16.46	.2759	-7.26	20.18	29.94	14.99	.55	1197.
10.000	21.33	17.28	.2904	-7.31	20.56	31.41	15.58	.57	1174.
11.000	22.12	16.64	.2846	-7.31	19.01	30.52	14.99	.57	[illegible]
12.000	22.15	15.05	.2740	-6.54	16.65	29.18	13.62	.64	1145.
13.000	21.12	12.50	.2598	-5.42	13.70	26.28	11.34	.56	1129.
14.000	19.62	10.47	.2316	-4.68	11.88	23.74	9.69	.49	1119.
15.000	17.83	8.89	.2259	-4.12	10.37	21.25	8.36	.30	1114.
16.000	15.65	8.01	.1699	-3.76	8.80	18.49	7.65	.30	1116.
17.000	13.06	7.16	.1093	-3.52	7.34	15.52	6.87	.54	1102.
18.000	10.24	6.45	.0687	-3.22	6.04	12.46	6.16	.70	1105.
19.000	7.65	5.99	.0467	-3.23	5.11	10.00	5.58	.81	1094.
20.000	5.77	6.16	.0104	-3.41	4.54	8.69	5.30	1.08	1077.
21.000	4.43	6.81	-.0741	-3.63	4.32	8.25	5.45	1.39	[illegible]
22.000	3.33	7.56	-.1215	-3.92	4.54	8.43	5.75	1.57	1011.
23.000	2.81	8.47	-.0767	-4.18	4.51	8.91	6.14	1.53	1004.
24.000	2.50	9.63	-.0391	-4.51	4.90	9.90	6.73	1.43	953.
25.000	2.14	10.60	.0584	-4.76	5.45	11.00	6.95	1.19	855.
26.000	2.58	12.00	.1875	-4.87	6.01	12.27	7.73	1.10	819.
27.000	3.34	13.60	.2765	-4.97	6.29	13.43	8.93	1.29	619.
28.000	2.33	13.84	.2867	-5.41	6.89	13.91	8.93	1.15	534.
29.000	5.22	16.85	.2766	-5.44	7.64	16.57	11.12	1.11	195.
30.000	7.42	18.56	.3090	-5.50	8.58	18.36	12.84	[illegible]	157.

TABLE I. 13 WIND STATISTICAL PARAMETERS, ANNUAL

STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	MEAN U M/S	S.D. U M/S	R(U,V)	MEAN V M/S	S.D. V M/S	MEAN WS M/S	S.D. WS M/S	SKEW WS	NOBS
1.288	-.07	2.33	-.4091	.57	4.16	4.24	2.26	1.60	14499.
2.000	1.21	2.69	-.2784	1.74	6.11	5.64	4.16	1.31	14468.
3.000	4.22	4.30	.0054	.89	5.87	7.36	4.17	.93	14458.
4.000	6.79	5.96	.0409	.30	7.62	10.54	5.35	.60	14446.
5.000	8.97	7.81	.0426	.09	9.84	13.65	7.21	.61	14450
6.000	10.89	9.55	.0659	-.14	11.79	16.34	9.05	.70	1445[illegible].
7.000	12.55	[illegible]	.0920	-.40	13.73	18.92	10.65	.76	14417.
8.000	13.89	12.58	.1241	-.60	15.58	21.26	11.94	.79	14309.
9.000	15.40	13.85	.1605	-.75	17.10	23.51	12.99	.80	14211.
10.000	16.97	14.41	.1706	-.75	17.62	25.09	13.30	.74	14010.
11.000	18.28	14.08	.1661	-.56	16.94	25.61	12.82	.64	1382[illegible].
12.000	18.93	12.93	.1548	-.25	15.29	24.93	11.76	.58	13757.
13.000	18.32	11.07	.1416	.09	13.06	22.94	10.13	.49	13668.
14.000	16.67	9.28	.0947	.19	11.07	20.31	8.61	.41	13593.
15.000	14.46	7.90	.0319	.15	9.38	17.45	7.42	.41	13547.
16.000	11.88	7.11	-.0510	-.10	7.74	14.35	6.76	.66	13519.
17.000	9.06	6.44	-.1210	-.38	6.22	11.19	6.09	.91	13430.
18.000	6.34	6.00	-.1343	-.66	5.07	8.54	5.43	1.16	13437.
19.000	4.09	5.68	-.1303	-.96	4.20	6.75	4.68	1.46	13358.
20.000	2.30	5.64	-.1352	-1.17	3.64	5.83	4.14	1.77	13240.
21.000	1.02	5.86	-.1308	-1.34	3.35	5.73	3.95	1.94	13014.
22.000	.04	6.19	-.1334	-1.48	3.26	5.93	4.00	2.03	12749.
23.000	-.49	6.70	-.1075	-1.61	3.15	6.29	4.25	1.94	1242[illegible].
24.000	-1.02	7.37	-.0554	-1.67	3.34	5.95	4.60	1.76	12137.
25.000	-1.28	8.09	.0121	-1.71	3.50	7.58	4.98	1.61	11520.
26.000	-1.14	9.04	.0827	-1.76	3.73	8.33	5.55	1.57	10767.
27.000	-1.37	10.01	.1154	-1.69	3.89	9.14	6.04	1.63	9101.
28.000	-1.05	10.71	.1601	-1.72	4.23	9.[illegible]5	6.46	1.58	8394.
29.000	-1.91	11.62	.1511	-1.36	4.29	10.59	6.85	1.67	4954.
30.000	-.64	12.79	.1817	-1.40	4.68	11.31	7.74	1.73	4134

TABLE 11.1 THERMODYNAMIC STATISTICAL PARAMETERS, JANUARY
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	MEAN P MB	S.D. P MB	SKEW P	MEAN T DEG K	S.D. T DEG K	SKEW T	MEAN D G/M3	S.D. D G/M3	SKEW D	NOBS P	NOBS T	NOBS D
.000	1026.3000	11.3250	.03	276.44	9.71	.64	1252.0000	59.5200	.76	1160.	1160.	1160.
1.000	906.1200	7.8471	-.21	272.53	6.53	-.45	1157.0000	35.2600	.50	1160.	1160.	1160.
1.288	874.2300	7.3148	-.26	271.30	6.32	-.40	1121.0000	31.3900	.40	1238.	1238.	1238.
2.000	799.4300	6.5281	-.25	270.22	5.86	-.29	1030.0000	23.6300	.36	1238.	1238.	1238.
3.000	703.8600	6.4464	-.13	265.01	6.13	-.33	924.6000	18.3600	.52	1237.	1237.	1237.
4.000	618.0700	7.0825	-.06	259.88	6.09	-.41	828.1000	13.3900	.72	1237.	1237.	1237.
5.000	541.3100	7.7360	-.08	253.99	6.18	-.44	742.2000	10.2300	.73	1237.	1237.	1237.
6.000	472.5700	8.1573	-.14	247.49	6.19	-.44	665.1000	7.7730	.54	1236.	1236.	1236.
7.000	410.9100	8.3397	-.19	240.49	6.01	-.32	595.2000	6.0750	.02	1236.	1236.	1236.
8.000	356.0000	8.4002	-.18	233.37	5.44	-.07	531.4000	5.5800	-.62	1236.	1236.	1236.
9.000	306.9700	8.0636	-.11	226.35	4.45	.25	472.4000	7.5240	-1.29	1234.	1234.	1234.
10.000	263.4900	7.3498	.02	220.24	3.77	.30	416.8000	11.0500	-1.20	1233.	1233.	1233.
11.000	225.4800	6.2847	.21	216.24	4.76	.67	363.5000	14.3500	-.69	1229.	1229.	1229.
12.000	[illegible]	[illegible]	.35	[illegible]	[illegible]	.22	312.1000	14.9800	.03	1227.	1227.	1227.
13.000	164.4600	3.9457	.38	215.97	5.65	-.38	265.6000	11.7400	.59	1222.	1222.	1222.
14.000	140.4700	3.1145	.34	215.67	4.44	-.18	227.0000	8.3360	.43	1221.	1221.	1221.
15.000	119.9400	2.4900	.27	214.37	4.31	.01	195.0000	6.8660	.35	1214.	1214.	1214.
16.000	102.3000	1.9576	.14	213.03	4.54	-.01	167.4000	5.7900	.35	1210.	1210.	1210.
17.000	87.1940	1.5431	.00	212.45	4.49	-.36	143.1000	4.5970	.51	1192.	1192.	1192.
18.000	74.3100	1.2572	-.20	212.48	4.09	-.42	121.9000	3.3740	.46	1177.	1177.	1177.
19.000	63.3590	1.0628	-.35	212.77	3.78	-.46	103.8000	2.4640	.35	1159.	1159.	1159.
20.000	54.0200	.9291	-.55	213.29	3.67	-.46	88.2500	1.8640	.14	1147.	1147.	1147.
21.000	46.0950	.8283	-.66	213.84	[illegible]	-.46	75.1100	1.4250	-.19	1100.	1100.	1100.
22.000	39.3470	.7510	-.68	214.40	3.78	-.46	63.9400	1.1440	-.30	1075.	1075.	1075.
23.000	33.6080	.6930	-.68	214.93	3.92	-.53	54.4800	.9763	-.50	1049.	1049.	1049.
24.000	28.7270	.6276	-.65	215.70	3.97	-.38	46.4000	.8654	-.80	1010.	1010.	1010.
25.000	24.5680	.5748	-.58	216.50	4.00	-.16	39.5400	.7773	-1.11	967.	967.	967.
26.000	21.0290	.5229	-.56	217.33	4.08	.10	33.7100	.7222	-1.35	907.	907.	907.
27.000	18.0130	.4709	-.51	218.14	4.24	.13	28.7700	.6672	-1.15	815.	815.	815.
28.000	15.4420	.4211	-.41	219.05	4.47	.09	24.5600	.6085	-.99	719.	719.	719.
29.000	13.2490	.3705	-.39	220.28	4.53	.02	20.9600	.5620	-1.00	571.	571.	571.
30.000	11.3810	.3434	-.31	221.74	4.64	.17	17.8800	.5384	-1.06	443.	443.	443.

TABLE II. 2 THERMODYNAMIC STATISTICAL PARAMETERS, FEBRUARY

STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	MEAN P MB	S.D. P MB	SKEW P	MEAN T DEG K	S.D. T DEG K	SKEW T	MEAN D G/M3	S.D. D G/M3	SKEW D	NOBS P	NOBS T	NOBS D
.000	1022.3000	9.5469	-.03	292.23	8.85	-.37	1260.0000	49.8100	.66	1091.	1091.	1091.
1.000	904.6100	6.9973	-.36	276.69	6.42	-.07	1137.0000	30.7900	.34	1091.	1091.	1091.
1.288	872.9900	6.6068	-.39	275.00	5.93	.01	1104.0000	27.0300	.24	1129.	1129.	1129.
2.000	799.0100	6.0621	-.43	272.06	5.15	.02	1022.0000	19.8500	.05	1129.	1129.	1129.
3.000	703.9300	5.9929	-.32	265.66	5.29	-.19	922.3000	15.8200	.29	1129.	1129.	1129.
4.000	618.2600	6.4060	-.23	259.92	5.27	-.38	828.2000	11.7500	.57	1129.	1129.	1129.
5.000	541.4300	6.8746	-.22	253.67	5.38	-.51	743.3000	9.3140	.67	1129.	1129.	1129.
6.000	472.5000	7.2102	-.25	246.80	5.47	-.45	666.8000	7.4320	.35	1128.	1128.	1128.
7.000	410.6600	7.3665	-.29	239.50	5.45	-.37	597.3000	6.0620	.08	1128.	1128.	1128.
8.000	355.5400	7.4345	-.29	232.24	5.02	-.16	533.3000	5.4420	-.68	1127.	1127.	1127.
9.000	306.3500	7.1618	-.23	225.20	4.14	.09	473.9000	7.2640	-1.33	1126.	1126.	1126.
10.000	262.7700	6.4861	-.09	219.40	3.67	.57	417.3000	10.8800	-1.19	1125.	1125.	1125.
11.000	224.8100	5.4673	.07	216.24	5.17	.64	362.5000	14.3100	-.52	1123.	1123.	1123.
12.000	192.0400	4.3678	.22	216.21	6.43	-.15	309.8000	14.0400	.22	1117.	1117.	1117.
13.000	164.1500	3.4375	.28	217.29	5.04	-.75	263.4000	9.8090	.61	1112.	1112.	1112.
14.000	140.3400	2.7714	.28	216.82	3.81	-.28	225.6000	7.0660	.33	1107.	1107.	1107.
15.000	119.9200	2.2267	.24	215.37	3.75	-.16	194.1000	6.0130	.35	1105.	1105.	1105.
16.000	102.3800	1.7481	.16	214.11	3.98	-.26	166.7000	5.1340	.40	1103.	1103.	1103.
17.000	87.3120	1.3806	.09	213.31	3.38	-.50	142.7000	4.1430	.55	1090.	1090.	1090.
18.000	74.4560	1.1108	.02	213.06	3.79	-.45	121.8000	3.1070	.47	1083.	1083.	1083.
19.000	63.5050	.9529	.04	213.31	3.56	-.38	103.7000	2.2360	.25	1070.	1070.	1070.
20.000	54.1570	.8320	.04	213.82	3.59	-.37	88.2700	1.6800	.12	1055.	1055.	1055.
21.000	46.2400	.7567	.10	214.31	3.72	-.26	75.1800	1.2810	.02	1011.	1011.	1011.
22.000	39.4890	.6973	.11	214.87	3.86	-.26	64.0300	1.0280	-.15	988.	988.	988.
23.000	33.7420	.6545	.11	215.51	3.86	-.15	54.5500	.8247	-.28	966.	966.	966.
24.000	28.8470	.6145	.10	216.29	3.97	-.18	46.4700	.7138	-.35	951.	951.	951.
25.000	24.6850	.5751	.10	217.12	4.02	-.19	39.6100	.6430	-.46	914.	914.	914.
26.000	21.1400	.5366	.12	218.08	4.11	-.09	33.7700	.5897	-.51	864.	864.	864.
27.000	18.1210	.4972	.13	219.17	4.16	.03	28.8000	.5427	-.51	764.	764.	764.
28.000	15.5430	.4585	.19	220.28	4.29	.07	24.5800	.5141	-.51	689.	689.	689.
29.000	13.3510	.4234	.14	221.44	4.43	-.02	21.0000	.4738	-.47	581.	581.	581.
30.000	11.4720	.3838	.04	222.73	4.56	-.01	17.9400	.4376	-.57	457.	457.	457.

TABLE II. 3 THERMODYNAMIC STATISTICAL PARAMETERS, MARCH

STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	MEAN P MB	S.D. P MB	SKEW P	MEAN T DEG K	S.D. T DEG K	SKEW T	MEAN D G/M3	S.D. D G/M3	SKEW D	NOBS P	NOBS T	NOBS D
.000	1016.4000	9.1261	.08	287.51	9.22	.10	1229.0000	48.0100	.20	1205.	1205.	1205.
1.000	901.2100	6.7073	-.15	280.60	7.15	.25	1117.0000	31.8600	.06	1205.	1205.	1205.
1.288	870.0400	6.3413	-.21	278.62	6.71	.26	1086.0000	28.3800	.03	1232.	1232.	1232.
2.000	796.9900	5.9675	-.29	274.09	5.79	.15	1012.0000	21.1800	.07	1231.	1231.	1231.
3.000	702.6500	5.9841	-.22	266.81	5.66	-.06	916.7000	16.8100	.30	1231.	1231.	1231.
4.000	617.3500	6.3735	-.13	260.36	5.33	-.36	825.6000	11.9000	.64	1231.	1231.	1231.
5.000	540.7300	6.8722	-.12	253.92	5.27	-.52	741.6000	8.7620	.88	1231.	1231.	1231.
6.000	471.9700	7.2100	-.17	247.02	5.40	-.55	665.5000	6.9820	.80	1231.	1231.	1231.
7.000	410.2300	7.3543	-.23	239.68	5.48	-.50	596.2000	5.5970	.43	1227.	1227.	1227.
8.000	355.2400	7.4574	-.25	232.34	4.99	-.16	532.6000	4.7310	-.59	1226.	1226.	1226.
9.000	306.1200	7.2130	-.19	225.33	4.13	.07	473.3000	6.9680	-1.59	1226.	1226.	1226.
10.000	262.6100	6.5371	-.04	219.73	3.39	.26	416.4000	10.7400	-1.22	1223.	1223.	1223.
11.000	224.7200	5.4930	.11	216.76	4.75	.51	361.4000	14.1500	-.48	1219.	1219.	1219.
12.000	192.0500	4.3036	.19	216.63	6.13	-.17	303.2000	14.2500	.20	1215.	1215.	1215.
13.000	164.1700	3.2673	.15	217.61	5.04	-.65	263.0000	10.1100	.60	1211.	1211.	1211.
14.000	140.4000	2.5667	.11	217.26	3.81	-.18	225.2000	7.0030	.27	1208.	1208.	1208.
15.000	120.0100	2.0355	.05	216.11	3.54	-.04	193.5000	5.5950	.22	1202.	1202.	1202.
16.000	102.5100	1.5998	-.10	215.12	3.57	-.28	166.1000	4.6020	.35	1197.	1197.	1197.
17.000	87.5090	1.2752	-.29	214.64	3.38	-.38	142.1000	3.5950	.34	1189.	1189.	1189.
18.000	74.7010	1.0292	-.47	214.41	3.06	-.45	121.4000	2.7020	.26	1179.	1179.	1179.
19.000	63.7790	.8641	-.61	214.48	2.88	-.45	103.6000	2.0150	.11	1165.	1165.	1165.
20.000	54.4480	.7382	-.73	214.84	2.82	-.33	88.3000	1.5140	-.03	1154.	1154.	1154.
21.000	46.5070	.6610	-.75	215.40	2.85	-.09	75.2200	1.1550	-.28	1107.	1107.	1107.
22.000	39.7460	.5945	-.65	216.01	2.95	.11	64.1100	.9319	-.27	1085.	1085.	1085.
23.000	33.9870	.5472	-.57	216.69	2.96	.20	54.6400	.7403	-.40	1059.	1059.	1059.
24.000	29.0740	.5019	-.47	217.35	3.12	.23	46.6000	.6378	-.68	1045.	1045.	1045.
25.000	24.8830	.4639	-.35	218.13	3.32	.18	39.7400	.5573	-.97	1007.	1007.	1007.
26.000	21.3190	.4319	-.20	219.10	3.52	.23	33.9000	.5035	-1.27	939.	939.	939.
27.000	18.2890	.3959	-.10	220.25	3.69	.28	28.9300	.4567	-1.58	846.	846.	846.
28.000	15.6990	.3620	.17	221.46	3.78	.29	24.7000	.3831	-.44	744.	744.	744.
29.000	13.4870	.3312	.19	222.74	3.83	.23	21.0900	.3603	-.21	624.	624.	624.
30.000	11.6180	.3068	.17	224.46	4.10	.21	18.0300	.3613	-.29	505.	505.	505.

TABLE II. 4 THERMODYNAMIC STATISTICAL PARAMETERS, APRIL

STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	MEAN P MB	S.D. P MB	SKEW P	MEAN T DEG K	S.D. T DEG K	SKEW T	MEAN D G/M3	S.D. D G/M3	SKEW D	NOBS P	NOBS T	NOBS D
.000	1012.9000	8.5074	-.01	292.08	9.58	.26	1205.0000	46.7500	-.02	1178.	1178.	1178.
1.000	899.7000	6.2211	-.19	284.69	7.40	.44	1099.0000	31.0400	-.20	1178.	1178.	1178.
1.288	869.0300	5.9082	-.22	282.66	6.92	.47	1069.0000	27.6300	-.24	1202.	1202.	1202.
2.000	797.0400	5.6028	-.26	277.87	5.77	.31	997.9000	20.0800	-.28	1202.	1202.	1202.
3.000	703.8400	5.6179	-.23	270.06	5.46	.18	907.0000	15.9500	-.02	1202.	1202.	1202.
4.000	619.3100	5.9713	-.12	262.95	5.05	-.13	819.9000	11.5800	.34	1202.	1202.	1202.
5.000	543.1400	6.3499	-.09	256.14	4.82	-.39	738.4000	8.4110	.65	1202.	1202.	1202.
6.000	474.6100	6.6015	-.11	249.14	4.90	-.49	663.5000	6.7730	.62	1202.	1202.	1202.
7.000	413.0500	6.7126	-.16	241.83	4.88	-.48	594.9000	5.4070	.38	1202.	1202.	1202.
8.000	358.1300	6.7437	-.19	234.53	4.60	-.40	531.9000	4.7990	-.24	1200.	1200.	1200.
9.000	309.0200	6.5512	-.17	227.46	3.89	-.17	473.3000	6.1520	-1.28	1199.	1199.	1199.
10.000	265.4800	5.9625	-.04	221.57	3.25	.01	417.5000	9.6240	-1.24	1197.	1197.	1197.
11.000	227.4200	5.0345	.14	217.77	4.25	.69	364.0000	12.7500	-.67	1197.	1197.	1197.
12.000	194.4500	3.9331	.30	216.64	5.77	.14	313.0000	13.3600	.01	1194.	1194.	1194.
13.000	166.2400	2.9554	.39	217.30	5.28	-.53	266.7000	10.1000	.52	1188.	1188.	1188.
14.000	142.1500	2.2696	.47	217.29	3.85	-.26	228.0000	6.6280	.33	1185.	1185.	1185
15.000	121.5300	1.8002	.50	216.39	3.48	.03	195.7000	5.1590	.24	1182.	1182.	1182.
16.000	103.8500	1.4167	.49	215.64	3.47	-.02	167.8000	4.2110	.39	1179.	1179.	1179.
17.000	88.6810	1.1293	.43	215.13	3.15	-.21	143.6000	3.2230	.64	1170.	1170.	1170.
18.000	75.7250	.9176	.28	214.83	2.81	-.31	122.8000	2.3730	.74	1159.	1159.	1159.
19.000	64.6690	.7747	.17	214.87	2.49	-.03	104.9000	1.7200	.55	1152.	1152.	1152.
20.000	55.2230	.6737	.12	215.24	2.43	.20	89.3900	1.3180	.37	1139.	1139.	1139.
21.000	47.1880	.5930	.09	215.82	2.47	.15	76.1700	1.0410	.39	1107.	1107.	1107.
22.000	40.3350	.5374	.09	216.57	2.46	.10	64.8800	.8540	.55	1086.	1086.	1086.
23.000	34.5110	.4899	.06	217.40	2.48	.11	55.3000	.7072	.25	1059.	1059.	1059.
24.000	29.5370	.4422	.08	218.32	2.50	.17	47.1300	.6054	.11	1034.	1034.	1034.
25.000	25.3000	.4045	.12	219.27	2.48	.08	40.2000	.5265	-.14	994.	994.	994.
26.000	21.6910	.3701	.12	220.46	2.48	.03	34.2800	.4619	-.29	951.	951.	951.
27.000	18.6070	.3359	.17	221.65	2.60	.19	29.2500	.4232	-.38	881.	881.	881.
28.000	15.9850	.3001	.23	223.10	2.74	.16	24.9600	.3871	-.28	807.	807.	807.
29.000	13.7440	.2696	.29	224.74	2.90	.08	21.3000	.3550	-.18	701.	701.	701.
30.000	11.8390	.2473	.29	[illegible]	[illegible]	-.03	[illegible]	.3271	[illegible]	[illegible]	[illegible]	[illegible]

TABLE II. 5 THERMODYNAMIC STATISTICAL PARAMETERS, MAY

STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	MEAN P MB	S.D. P MB	SKEW P	MEAN T DEG K	S.D. T DEG K	SKEW T	MEAN D G/M3	S.D. D G/M3	SKEW D	NOBS P	NOBS T	NOBS D
.000	1010.4000	7.8829	.14	296.99	11.23	.18	1182.0000	52.2800	.01	1207.	1207.	1207.
1.000	899.2800	5.2040	.00	289.99	8.50	.26	1078.0000	33.7400	-.07	1207.	1207.	1207.
1.288	869.1000	4.8701	-.07	288.14	7.87	.25	1048.0000	29.7100	-.07	1241.	1241.	1241.
2.000	798.6000	4.6939	-.30	284.03	6.05	-.27	977.7000	20.0600	.26	1241.	1241.	1241.
3.000	707.1100	4.3528	-.47	276.14	5.66	-.36	890.8000	15.5700	.39	1241.	1241.	1241.
4.000	623.9200	5.4926	-.53	268.49	5.00	-.50	808.7000	10.7200	.55	1241.	1241.	1241.
5.000	548.7100	5.9342	-.54	261.18	4.50	-.72	731.3000	7.1460	.70	1241.	1241.	1241.
6.000	480.7500	6.1765	-.57	254.08	4.46	-.75	658.9000	5.6830	.44	1241.	1241.	1241.
7.000	419.4500	6.2802	-.60	246.79	4.61	-.77	591.9000	5.0360	.10	1241.	1241.	1241.
8.000	364.7400	6.3300	-.62	239.31	4.51	-.66	530.9000	4.4100	-.41	1240.	1240.	1240.
9.000	315.6400	6.2339	-.60	231.72	4.08	-.40	474.5000	4.9020	-1.47	1239.	1239.	1239.
10.000	271.8300	5.8173	-.46	224.68	3.38	-.17	421.5000	7.2750	-2.00	1239.	1239.	1239.
11.000	233.2300	5.1610	-.28	219.04	3.61	.54	371.0000	10.3000	-1.46	1236.	1236.	1236.
12.000	193.4700	4.2351	-.12	215.38	4.30	.55	322.0000	12.1300	-.56	1233.	1233.	1233.
13.000	170.3800	3.2780	-.03	215.70	5.38	.00	275.4000	10.8900	.04	1232.	1232.	1232.
14.000	145.5500	2.5252	-.04	216.17	4.47	-.41	234.7000	7.7790	.37	1225.	1225.	1225.
15.000	124.3600	1.9947	-.09	215.82	3.70	-.16	200.8000	5.5690	.09	1223.	1223.	1223.
16.000	106.2100	1.6077	-.07	215.09	3.42	-.27	172.1000	4.3820	.07	1221.	1221.	1221.
17.000	90.6760	1.2949	-.07	214.60	2.99	-.36	147.2000	3.3460	.00	1217.	1217.	1217.
18.000	77.4050	1.0631	-.06	214.55	2.55	-.16	125.7000	2.5490	.02	1209.	1209.	1209.
19.000	66.0990	.8835	-.09	215.08	2.13	.02	107.1000	1.8650	.05	1202.	1202.	1202.
20.000	55.4680	.7502	-.11	215.86	2.01	.20	91.1400	1.4300	.14	1196.	1196.	1196.
21.000	48.2690	.6477	-.10	216.99	1.99	.39	77.5000	1.1080	.11	1147.	1147.	1147.
22.000	41.3010	.5743	-.10	218.13	1.94	.35	65.9600	.8841	.02	1134.	1134.	1134.
23.000	35.3840	.5113	-.08	219.38	1.94	.39	56.1900	.7165	-.06	1115.	1115.	1115.
24.000	30.3250	.4589	-.04	220.77	2.03	.37	47.8500	.6076	-.13	1099.	1099.	1099.
25.000	26.0030	.4163	-.06	222.19	2.10	.31	40.8200	.5194	-.19	1094.	1094.	1094.
26.000	22.3610	.3741	-.07	223.66	2.13	.20	34.8300	.4504	-.16	1040.	1040.	1040.
27.000	19.2110	.3352	-.04	225.26	2.25	.25	29.7100	.3976	-.20	931.	931.	931.
28.000	16.5360	.3053	-.02	226.95	2.32	.32	25.3800	.3622	-.18	863.	863.	863.
29.000	14.2480	.2753	.02	228.71	2.41	.45	21.7000	.3257	.03	767.	767.	767.
30.000	12.2970	.2469	.07	230.56	2.35	.13	18.5800	.2919	.10	651.	651.	651.

TABLE II. 6 THERMODYNAMIC STATISTICAL PARAMETERS, JUNE
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	MEAN P MB	S.D. P MB	SKEW P	MEAN T DEG K	S.D. T DEG K	SKEW T	MEAN D G/M3	S.D. D G/M3	SKEW D	NOBS P	NOBS T	NOBS D
.000	1008.5000	7.2747	.15	302.09	12.17	.14	1159.0000	54.0900	.02	1147.	1147.	1147.
1.000	899.3800	4.3676	-.05	295.19	9.05	.22	1058.0000	34.1400	-.05	1147.	1147.	1147.
1.288	869.6800	4.0774	-.14	293.40	8.36	.23	1030.0000	29.9200	-.05	1195.	1195.	1195.
2.000	800.4100	3.9398	-.44	289.52	5.75	-.20	960.7000	18.2600	.27	1195.	1195.	1195.
3.000	710.4100	4.3328	-.49	281.60	5.36	-.30	877.1000	14.1000	.42	1194.	1194.	1194.
4.000	628.4400	4.8586	-.48	273.81	4.65	-.34	798.3000	9.4760	.52	1194.	1194.	1194.
5.000	554.0500	5.2352	-.46	266.29	4.00	-.43	724.0000	5.9760	.64	1194.	1194.	1194.
6.000	436.7300	5.4740	-.43	259.19	3.80	-.47	653.7000	4.7240	.23	1194.	1194.	1194.
7.000	425.8900	5.5641	-.42	252.16	3.93	-.46	588.1000	4.2900	.09	1192.	1192.	1192.
9.000	371.4400	5.5374	-.42	244.74	3.95	-.41	528.5000	3.8460	-.28	1191.	1191.	1191.
9.000	322.4800	5.4784	-.42	237.00	3.88	-.36	473.9000	3.6510	-.79	1191.	1191.	1191.
10.000	278.6300	5.3076	-.35	229.40	3.56	-.21	423.1000	4.5030	-1.96	1191.	1191.	1191.
11.000	239.7800	4.9328	-.25	222.82	3.27	.26	374.9000	6.8880	-1.79	1189.	1189.	1189.
12.000	205.4800	4.2673	-.09	218.30	3.87	.49	328.0000	9.3200	-1.02	1187.	1187.	1187.
13.000	175.7600	3.5439	.09	216.41	4.49	-.01	283.1000	9.7200	-.29	1186.	1186.	1186.
14.000	150.1500	2.8013	.19	215.36	4.18	-.19	243.0000	8.2110	.10	1186.	1186.	1186.
15.000	128.1500	2.1499	.19	213.95	4.02	-.20	208.8000	6.7550	.26	1180.	1180.	1180.
16.000	109.2900	1.6385	.16	212.83	3.87	-.32	179.0000	5.4100	.34	1179.	1179.	1179.
17.000	93.1480	1.2333	.12	212.54	3.41	-.39	152.7000	3.9640	.29	1176.	1176.	1176.
18.000	79.4050	.9591	.12	213.27	2.55	-.08	129.7000	2.5800	.18	1171.	1171.	1171.
19.000	67.7760	.7990	.14	214.83	2.01	.01	109.9000	1.7560	.26	1163.	1163.	1163.
20.000	57.8990	.6749	.10	216.34	1.74	.12	93.2400	1.2540	.16	1156.	1156.	1156.
21.000	49.5210	.5914	.11	217.83	1.57	.13	79.2000	.9888	.06	1125.	1125.	1125.
22.000	42.3980	.5186	.14	219.35	1.39	-.01	67.3300	.7713	-.02	1097.	1097.	1097.
23.000	36.3560	.4586	.17	220.91	1.38	.04	57.3300	.6294	.10	1077.	1077.	1077.
24.000	31.1950	.4122	.17	222.50	1.48	-.03	48.8400	.5386	.09	1053.	1053.	1053.
25.000	26.8090	.3667	.15	224.10	1.52	-.01	41.6800	.4616	.07	1061.	1061.	1061.
26.000	23.0590	.3261	.12	225.75	1.59	.00	35.5800	.4079	.09	1018.	1018.	1018.
27.000	19.8520	.2932	.09	227.43	1.76	.01	30.4100	.3637	.13	943.	943.	943.
28.000	17.1070	.2588	.10	229.09	1.81	-.06	26.0100	.3235	.07	850.	850.	850.
29.000	14.7580	.2345	.08	230.85	1.99	-.01	22.2700	.2985	.05	738.	738.	738.
30.000	12.7510	.2114	.09	232.66	2.05	-.21	19.0300	.2645	.05	626.	626.	626.

TABLE 11. 7 THERMODYNAMIC STATISTICAL PARAMETERS, JULY
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	MEAN P MB	S.D. P MB	SKEW P	MEAN T DEG K	S.D. T DEG K	SKEW T	MEAN D G/M3	S.D. D G/M3	SKEW D	NOBS P	NOBS T	NOBS D
.000	1007.4000	6.4674	.03	307.79	12.45	-.10	1135.0000	53.6200	.21	1162.	1162.	1162.
1.000	900.3300	3.2036	-.42	300.90	8.73	-.06	1039.0000	31.9500	.16	1162.	1162.	1162.
1.288	871.1800	2.7912	-.51	298.98	7.79	-.05	1012.0000	26.9900	.15	1243.	1243.	1243.
2.000	803.1100	2.5213	-.59	295.25	3.44	-.56	944.6000	11.0600	.51	1243.	1243.	1243.
3.000	714.5100	2.4934	-.62	287.26	2.80	-.68	864.2000	7.5850	.57	1243.	1243.	1243.
4.000	633.5700	2.6152	-.58	278.94	2.31	-.52	789.6000	5.1900	.35	1243.	1243.	1243.
5.000	559.8900	2.6795	-.61	270.69	2.07	-.41	719.3000	3.8810	.20	1243.	1243.	1243.
6.000	492.9300	2.7586	-.59	263.37	2.27	-.31	651.3000	4.1690	-.02	1243.	1243.	1243.
7.000	432.2900	2.8012	-.61	256.71	2.48	-.35	586.2000	3.9390	.02	1242.	1242.	1242.
8.000	377.9700	2.8241	-.61	249.67	2.65	-.26	527.1000	3.6080	.04	1241.	1241.	1241.
9.000	329.1200	2.8678	-.59	242.30	2.82	-.30	473.0000	3.2530	.07	1241.	1241.	1241.
10.000	285.3600	2.8986	-.58	234.86	2.87	-.34	423.1000	3.0150	-.01	1240.	1240.	1240.
11.000	246.4100	2.8452	-.54	227.77	2.71	-.27	376.9000	3.1080	-.66	1237.	1237.	1237.
12.000	211.6000	2.0127	-.56	221.40	2.40	-.31	332.0000	3.9590	-.90	1235.	1235.	1235.
13.000	181.3000	2.3316	-.40	216.45	2.47	.15	291.8000	5.1770	-.89	1233.	1233.	1233.
14.000	154.7200	1.9142	-.29	212.20	2.90	.62	254.1000	5.5270	-.66	1228.	1228.	1228.
15.000	131.6500	1.4825	-.20	209.00	3.29	.58	219.5000	5.0640	-.49	1226.	1226.	1226.
16.000	111.8700	1.1669	-.11	207.93	3.11	.25	187.5000	3.9410	-.18	1222.	1222.	1222.
17.000	95.0460	.9135	-.16	209.16	2.52	.11	158.3000	2.6200	-.06	1219.	1219.	1219.
18.000	80.8660	.7721	-.15	211.51	2.13	.12	133.2000	1.8560	-.10	1218.	1218.	1218.
19.000	68.9560	.6588	-.16	214.16	1.82	.09	112.2000	1.3810	-.25	1209.	1209.	1209.
20.000	58.8930	.5693	-.06	216.25	1.59	-.09	94.8800	1.0320	-.06	1198.	1198.	1198.
21.000	50.3760	.5000	-.05	218.25	1.45	-.12	80.4100	.8350	-.09	1186.	1186.	1186.
22.000	43.1480	.4383	-.04	219.91	1.31	-.07	68.3500	.6712	-.11	1129.	1129.	1129.
23.000	37.0050	.3858	-.03	221.54	1.34	-.17	58.1900	.5564	-.08	1111.	1111.	1111.
24.000	31.7700	.3451	-.02	223.11	1.34	-.10	49.6100	.4787	-.09	1091.	1091.	1091.
25.000	27.3150	.3071	-.03	224.68	1.36	.01	42.3500	.4122	-.09	1112.	1112.	1112.
26.000	23.4980	.2718	-.04	226.23	1.41	-.03	36.1900	.3599	-.11	1050.	1050.	1050.
27.000	20.2300	.2404	-.03	227.92	1.61	.00	30.9200	.3246	-.13	996.	996.	996.
28.000	17.4350	.2089	-.03	229.46	1.64	-.08	26.4700	.2646	-.07	859.	859.	859.
29.000	15.0430	.1885	.03	231.01	1.84	-.08	22.6900	.2332	.02	760.	760.	760.
30.000	13.0030	.1730	.02	232.68	1.96	-.11	19.4700	.2115	-.13	645.	645.	645.

TABLE II. 8 THERMODYNAMIC STATISTICAL PARAMETERS, AUGUST

STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	MEAN P MB	S.D. P MB	SKEW P	MEAN T DEG K	S.D. T DEG K	SKEW T	MEAN D G/M3	S.D. D G/M3	SKEW D	NOBS P	NOBS T	NOBS D
.000	1008.4000	6.6234	.09	306.14	12.26	-.07	1143.0000	53.6800	.20	1192.	1192.	1192.
1.000	900.7400	3.3035	-.22	299.36	8.73	-.03	1044.0000	32.5400	.17	1192.	1192.	1192.
1.288	871.4600	2.9723	-.31	297.39	7.83	-.04	1017.0000	27.7000	.19	1238.	1238.	1238.
2.000	803.0700	2.7104	-.43	293.83	4.21	-.84	949.1000	13.6700	.89	1238.	1238.	1238.
3.000	714.1100	2.8289	-.61	285.87	3.71	-1.08	868.0000	9.9960	1.11	1238.	1238.	1238.
4.000	632.9700	3.1584	-.69	277.71	3.14	-1.06	792.2000	6.6650	.96	1238.	1238.	1238.
5.000	558.9700	3.3777	-.77	269.85	2.62	-.76	720.4000	4.3580	.35	1238.	1238.	1238.
6.000	491.9600	3.5010	-.81	262.83	2.57	-.56	651.4000	4.0660	.01	1239.	1238.	1239.
7.000	431.3500	3.5100	-.85	256.26	2.77	-.42	586.0000	3.8700	-.04	1238.	1238.	1238.
8.000	377.0400	3.5609	-.79	[illegible]	2.97	-.35	526.9000	3.5970	-.06	1237.	1237.	1237.
9.000	328.2300	3.5552	-.73	241.75	3.10	-.15	472.8000	3.3360	-.04	1235.	1235.	1235.
10.000	284.4700	3.5407	-.65	234.23	3.17	-.14	422.9000	3.1970	-.62	1234.	1234.	1234.
11.000	245.5400	3.4535	-.52	227.19	3.06	-.20	376.5000	3.7650	-1.49	1230.	1230.	1230.
12.000	210.8600	3.1400	-.42	221.15	2.72	-.25	332.2000	4.7660	-1.51	1228.	1228.	1228.
13.000	180.6000	2.7782	-.29	216.50	2.35	.37	290.6000	5.7200	-.94	1228.	1228.	1228.
14.000	154.1400	2.2838	-.18	212.57	2.81	.51	252.7000	6.1180	-.54	1227.	1227.	1227.
15.000	131.2000	1.7729	-.12	209.62	3.43	.47	218.1000	5.7500	-.37	1224.	1224.	1224.
16.000	111.5400	1.3515	-.04	208.55	3.52	.27	186.4000	4.7100	-.17	1217.	1217.	1217.
17.000	94.8080	1.0372	-.02	209.51	2.90	.35	157.7000	3.2370	-.22	1208.	1208.	1208.
18.000	80.6810	.8444	.03	211.60	2.34	.29	132.8000	2.1970	-.14	1198.	1198.	1198.
19.000	68.7990	.7037	.01	214.16	2.00	.33	111.9000	1.5590	-.22	1188.	1188.	1188.
20.000	58.7540	.6067	.09	216.18	1.72	.17	94.6900	1.1210	-.09	1179.	1179.	1179.
21.000	50.2550	.5343	.09	218.05	1.50	.10	80.2900	.8393	-.01	1163.	1163.	1163.
22.000	43.0360	.4767	.11	219.59	1.44	-.01	68.2800	.6679	-.01	1117.	1117.	1117.
23.000	36.9040	.4256	.10	221.06	1.47	-.01	58.1600	.5602	.03	1103.	1103.	1103.
24.000	31.6700	.3838	.11	222.50	1.47	-.05	49.5900	.4931	.04	1085.	1085.	1085.
25.000	27.2150	.3440	.07	223.98	1.49	-.03	42.3300	.4254	.10	1087.	1087.	1087.
26.000	23.4000	.3075	.08	225.44	1.54	.07	36.1600	.3625	.07	1041.	1041.	1041.
27.000	20.1380	.2745	.05	226.96	1.70	-.01	30.9100	.3261	.02	986.	986.	986.
28.000	17.3410	.2413	.04	228.28	1.78	-.18	26.4600	.2813	.03	876.	876.	876.
29.000	14.9460	.2194	.06	229.68	1.92	-.26	22.6700	.2540	.07	787.	787.	787.
30.000	12.9060	.1958	.11	231.11	1.93	-.05	19.4500	.2237	.00	670.	[illegible]	[illegible]

TABLE 11. 9 THERMODYNAMIC STATISTICAL PARAMETERS, SEPTEMBER
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	MEAN P MB	S.D. P MB	SKEW P	MEAN T DEG K	S.D. T DEG K	SKEW T	MEAN D G/M3	S.D. D G/M3	SKEW D	NOBS P	NOBS T	NOBS D
.000	1011.6000	8.0599	.17	300.29	12.35	-.07	1170.0000	57.5000	.24	1141.	1141.	1141.
1.000	901.6100	4.6527	-.19	293.82	9.07	.00	1066.0000	36.0500	.18	1141.	1141.	1141.
1.288	871.7700	4.1815	-.34	291.94	8.27	.00	1038.0000	31.3200	.17	1200.	1200.	1200.
2.000	802.1300	3.7819	-.58	288.69	5.54	-.65	965.7000	18.8800	.65	1200.	1200.	1200.
3.000	711.7100	3.9976	-.71	281.06	5.10	-.89	880.5000	14.2300	.90	1200.	1200.	1200.
4.000	629.4500	4.4574	-.77	273.52	4.33	-1.06	800.5000	9.2430	1.13	1200.	1200.	1200.
5.000	554.9700	4.8091	-.85	266.50	3.84	-1.10	724.6000	6.2110	.94	1200.	1200.	1200.
6.000	487.6500	5.0565	-.90	259.87	3.82	-1.11	653.2000	5.3520	.62	1200.	1200.	1200.
7.000	426.8600	5.1220	-.95	252.98	3.74	-1.09	587.5000	4.5630	.23	1200.	1200.	1200.
8.000	372.4300	5.1178	-.99	245.62	3.62	-.93	528.0000	4.1380	-.30	1200.	1200.	1200.
9.000	323.5200	4.9909	-.97	238.00	3.36	-.54	473.3000	4.2430	-.96	1200.	1200.	1200.
10.000	279.7400	4.7801	-.86	230.61	3.09	-.03	422.5000	5.1600	-1.68	1199.	1199.	1199.
11.000	240.9200	4.3380	-.69	224.26	3.16	.22	374.3000	6.7700	-1.64	1195.	1195.	1195.
12.000	206.6400	3.6224	-.50	219.72	3.40	.09	327.7000	7.0300	-1.10	1193.	1193.	1193.
13.000	176.8700	3.2471	-.33	216.62	3.33	.05	284.5000	7.5770	-.74	1190.	1190.	1190.
14.000	151.0300	2.6544	-.22	213.77	3.33	.41	246.2000	6.9420	-.46	1188.	1188.	1188.
15.000	128.6800	2.0847	-.17	211.41	3.58	.41	212.1000	6.1000	-.30	1184.	1184.	1184.
16.000	109.5300	1.6452	-.08	210.15	3.62	.32	181.6000	5.0520	-.23	1179.	1179.	1179.
17.000	93.1910	1.2823	-.07	210.40	3.26	.34	154.4000	3.7690	-.24	1172.	1172.	1172.
18.000	79.3270	1.0297	.01	211.49	2.89	.38	130.7000	2.6940	-.25	1167.	1167.	1167.
19.000	67.6160	.8595	.01	213.23	2.54	.29	110.5000	1.9170	-.18	1159.	1159.	1159.
20.000	57.7020	.7368	.01	214.92	2.49	.11	93.5400	1.4790	-.13	1148.	1148.	1148.
21.000	49.2990	.6489	.03	216.48	2.39	.07	79.3400	1.1420	-.06	1112.	1112.	1112.
22.000	42.1710	.5803	.05	217.92	2.29	.03	67.4200	.9166	-.09	1094.	1094.	1094.
23.000	36.1230	.5186	.06	219.49	2.20	.06	57.3300	.7503	-.06	1070.	1070.	1070.
24.000	30.9620	.4700	.06	221.03	2.07	.00	48.8000	.6328	-.05	1057.	1057.	1057.
25.000	26.5780	.4235	.07	222.44	1.94	.04	41.6300	.5414	-.06	1066.	1066.	1066.
26.000	22.8320	.3769	.08	223.84	1.95	.05	35.5300	.4685	-.11	1022.	1022.	1022.
27.000	19.6320	.3401	.11	225.21	2.03	.07	30.3700	.4128	.01	941.	941.	941.
28.000	16.8910	.3030	.11	226.38	2.05	-.02	25.9900	.3540	-.08	867.	867.	867.
29.000	14.5450	.2738	.16	227.61	2.26	.09	22.2600	.3075	.00	771.	771.	771.
30.000	12.5400	.2439	.19	228.79	2.23	.04	19.0900	.2695	.05	644.	644.	644.

TABLE II. 10 THERMODYNAMIC STATISTICAL PARAMETERS, OCTOBER
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	MEAN P MB	S.D. P MB	SKEW P	MEAN T DEG K	S.D. T DEG K	SKEW T	MEAN D G/M3	S.D. D G/M3	SKEW D	NOBS P	NOBS T	NOBS D
.000	1016.9000	8.8696	.12	292.50	11.60	.00	1209.0000	57.6700	.22	1168.	1168.	1188.
1.000	903.7200	5.7652	-.22	286.88	8.56	.17	1095.0000	35.9100	.05	1168.	1168.	1168.
1.288	873.3200	5.4051	-.33	285.32	7.87	.18	1064.0000	31.2500	.02	1241.	1241.	1241.
2.000	802.0700	5.1320	-.48	282.74	6.04	-.42	986.6000	20.4200	.33	1241.	1241.	1241.
3.000	709.9700	5.4289	-.57	275.94	5.73	-.63	895.1000	15.2800	.60	1241.	1241.	1241.
4.000	626.5800	6.0345	-.60	269.57	5.18	-.84	808.9000	10.2400	.91	1241.	1241.	1241.
5.000	551.4500	6.5266	-.66	263.32	5.02	-.95	729.0000	7.6110	.93	1241.	1241.	1241.
6.000	483.7600	6.8420	-.72	256.69	5.00	-1.03	656.2000	6.1060	.80	1241.	1241.	1241.
7.000	422.7200	6.9999	-.76	249.60	4.89	-1.06	589.7000	5.1080	.21	1241.	1241.	1241.
8.000	358.1500	6.9559	-.82	242.16	4.64	-.94	529.4000	4.6090	-.41	1241.	1241.	1241.
9.000	319.1500	6.7597	-.82	234.59	4.08	-.45	473.7000	5.2010	-1.26	1241.	1241.	1241.
10.000	275.3600	6.3348	-.71	227.43	3.47	-.03	421.8000	7.4480	-1.84	1239.	1239.	1239.
11.000	236.6900	5.6805	-.57	221.45	3.47	.44	372.4000	9.9420	-1.42	1237.	1237.	1237.
12.000	202.6800	4.7860	-.44	217.22	4.22	.44	325.2000	11.0700	-.89	1235.	1235.	1235.
13.000	173.1700	3.9261	-.29	214.68	4.35	.12	281.2000	10.1700	-.48	1232.	1232.	1232.
14.000	147.7000	3.1328	-.17	212.72	4.11	.14	242.0000	8.6330	-.33	1229.	1229.	1225.
15.000	125.7900	2.4143	-.12	210.79	4.06	.52	208.0000	7.1920	-.32	1221.	1221.	1221.
16.000	107.0200	1.8522	-.03	209.65	4.21	.42	177.9000	5.9330	-.21	1217.	1217.	1217.
17.000	91.0060	1.4167	-.01	209.86	3.82	.29	151.1000	4.4390	-.12	1208.	1208.	1208.
18.000	77.4250	1.1076	.00	210.66	3.24	.10	128.1000	3.1500	.02	1201.	1201.	1201.
19.000	65.9420	.9034	.00	211.80	2.61	.16	108.5000	2.1660	.01	1190.	1190.	1190.
20.000	56.2000	.7560	-.02	213.04	2.33	.24	91.9100	1.5630	-.03	1182.	1182.	1182.
21.000	47.9400	.6521	.00	214.34	2.23	.21	77.9200	1.1520	-.12	1136.	1136.	1136.
22.000	40.9400	.5803	.04	215.49	2.24	.24	66.1900	.8853	.00	1110.	1110.	1110.
23.000	35.0030	.5213	.04	216.70	2.28	.18	56.2700	.7127	.00	1094.	1094.	1094.
24.000	29.9420	.4719	.08	217.92	2.42	.13	47.8700	.5982	.00	1089.	1089.	1089.
25.000	25.6490	.4311	.08	219.02	2.49	.18	40.8000	.5206	-.09	1077.	1077.	1077.
26.000	21.9860	.3966	.10	220.19	2.56	.13	34.7800	.4454	-.16	1046.	1046.	1046.
27.000	18.8600	.3650	.15	221.33	2.71	.10	29.6800	.3938	-.22	970.	970.	970.
28.000	16.1880	.3356	.16	222.27	2.95	-.08	25.3700	.3499	-.29	900.	900.	900.
29.000	13.9040	.3040	.11	223.29	3.10	-.05	21.6900	.3113	-.22	793.	793.	793.
30.000	11.9550	.2789	[illegible]	224.30	3.15	-.05	18.5700	.2763	-.10	[illegible]	[illegible]	[illegible]

TABLE II. 11 THERMODYNAMIC STATISTICAL PARAMETERS, NOVEMBER
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	MEAN P MB	S.D. P MB	SKEW P	MEAN T DEG K	S.D. T DEG K	SKEW T	MEAN D G/M3	S.D. D G/M3	SKEW D	NOBS P	NOBS T	NOBS D
.000	1021.2000	9.3441	.18	285.23	8.99	-.17	1245.0000	49.5100	.43	1155.	1155.	1155.
1.000	904.8700	6.5990	-.17	279.97	6.60	.10	1124.0000	31.0400	.22	1155.	1155.	1155.
1.288	873.6900	6.2220	-.26	278.36	6.09	.15	1091.0000	27.2400	.17	1202.	1202.	1202.
2.000	800.5600	5.6787	-.48	275.63	5.64	-.03	1010.0000	20.9600	.20	1202.	1202.	1202.
3.000	706.4900	5.7036	-.50	269.61	5.56	-.28	911.9000	15.9100	.48	1202.	1202.	1202.
4.000	621.7600	6.2164	-.44	264.00	5.41	-.50	819.8000	11.6000	77	1202.	1202.	1202.
5.000	545.7100	5.7732	-.43	258.04	5.43	-.63	736 3000	8.8930	.83	1202.	1202.	1202.
6.000	477.4200	7.1382	-.47	251.56	5.40	-.69	660.9000	7.0810	.58	1202.	1202.	1202.
7.000	416.0800	7.2477	-.47	244.64	5.40	-.57	592.4000	6.0530	.17	1200.	1200.	1200.
8.000	361.3800	7.2975	-.48	237.49	5.13	-.37	530.0000	5.3420	-.45	1200.	1200.	1200.
9.000	312.4500	7.1163	-.42	230.37	4.41	-.08	472.4000	6.2450	-1.24	1199.	1199.	1199.
10.000	268.8800	6.5964	-.31	223.89	3.74	.16	418.4000	8.6850	-1.35	1198.	1198.	1198.
11.000	230.6000	5.8288	-.18	218.89	4.04	.60	367.1000	11.3900	-.90	1198.	1198.	1198.
12.000	197.2100	4.8748	-.05	215.94	4.93	.34	316.4000	[illegible]	-.35	[illegible]	[illegible]	[illegible]
13.000	168.3800	3.9076	.03	214.48	5.03	-.23	273.7000	11.1800	.12	1189.	1189.	1189.
14.000	143.6100	3.0514	.05	213.20	4.34	-.22	234.6000	8.7340	.17	1179.	1179.	1179.
15.000	122.3800	2.3633	.02	211.71	4.24	-.02	201.5000	7.1810	.13	1175.	1175.	1175.
16.000	104.1900	1.8054	-.01	210.76	4.21	-.15	172.3000	5.7540	.18	1168.	1168.	1168.
17.000	88.6690	1.3947	-.04	210.69	3.72	-.13	146.7000	4.2310	.11	1157.	1157.	1157.
18.000	75.4810	1.0998	-.08	210.36	3.12	-.11	124.7000	3.0170	10	1148.	1148.	1148.
19.000	64.2860	.9011	-.11	211.35	2.67	.04	106.0000	2.1660	-.13	1134.	1134.	1134.
20.000	54.7580	.7590	-.14	211.85	2.44	-.16	90.0600	1.5660	-.07	1110.	1110.	1110.
21.000	46.6660	.6553	-.10	212.52	2.29	-.12	76.5000	1.1850	-.11	1055.	1055.	1055.
22.000	39.8000	.5725	-.08	213.36	2.38	-.46	64.9900	.9515	-.25	1031.	1031.	1031.
23.000	33.9750	.5143	-.12	214.34	2.41	-.33	55.2200	.7673	-.42	997.	997.	997.
24.000	29.0250	.4611	-.18	215.36	2.60	-.36	46.9500	.6298	-.35	1003.	1003.	1003.
25.000	24.8150	.4235	-.17	216.24	2.70	-.20	39.9800	.5505	-.57	970.	970.	970.
26.000	21.2310	.3854	-.19	217.08	2.75	-.22	34.0700	.4822	-.45	934.	934.	934.
27.000	18.1810	.3483	-.15	218.02	2.87	-.18	29.0500	.4346	-.50	843.	843.	843.
28.000	15.5740	.3166	-.12	218.74	3.02	-.07	24.8000	.3816	-.32	759.	759.	759.
29.000	13.3650	.2745	-.02	219.65	3.09	-.05	21.2000	.3187	.00	608.	608.	608.
30.000	11.4850	.2480	-.03	220.58	3.24	-.15	18.1400	.2790	.13	442.	442.	442.

TABLE 11. 12 THERMODYNAMIC STATISTICAL PARAMETERS, DECEMBER

STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	MEAN P MB	S.D. P MB	SKEW P	MEAN T DEG K	S.D. T DEG K	SKEW T	MEAN D G/M3	S.D. D G/M3	SKEW D	NOBS P	NOBS T	NOBS D
.000	1025.2000	10.3970	-.05	277.86	8.72	-.59	1284.0000	52.3000	.73	1161.	1161.	1161.
1.000	905.7700	7.5422	-.28	273.82	6.21	-.40	1151.0000	31.7100	.45	1161.	1161.	1161.
1.299	874.1000	7.1964	-.31	272.53	5.65	-.29	1116.0000	27.4600	.29	1238.	1238.	1238.
2.000	799.6100	6.5847	-.37	271.27	5.75	-.14	1025.0000	22.1600	.12	1238.	1238.	1238.
3.000	704.4000	6.6178	-.40	266.13	6.09	-.30	921.4000	17.4700	.37	1238.	1238.	1238.
4.000	618.9300	7.2053	-.37	260.97	6.07	-.51	825.7000	12.8000	.61	1237.	1237.	1237.
5.000	542.3600	7.8488	-.41	255.06	6.19	-.04	740.5000	9.9930	.73	1237.	1237.	1237.
6.000	473.7200	8.2953	-.45	248.45	6.22	-.64	664.1000	7.5930	.51	1237.	1237.	1237.
7.000	412.1500	8.4913	-.49	241.47	6.06	-.57	594.5000	6.0110	.19	1235.	1235.	1235.
8.000	357.2600	8.5005	-.49	234.40	5.38	-.36	530.9000	5.6720	-.50	1233.	1233.	1233.
9.000	308.2800	8.1493	-.42	227.56	4.21	-.02	471.9000	8.0170	-1.32	1233.	1233.	1233.
10.000	264.8600	7.3492	-.30	221.69	3.50	.31	416.3000	11.5300	-1.16	1232.	1232.	1232.
11.000	226.8700	6.2623	-.15	217.64	4.62	.56	363.4000	14.3600	-.68	1228.	1228.	1228.
12.000	193.9200	5.0639	-.02	215.84	6.06	.09	313.4000	14.8100	-..1	1227.	1227.	1227.
13.000	165.6000	3.9504	.07	215.45	5.77	-.42	268.0000	11.9200	.21	1223.	1223.	1223.
14.000	141.3600	3.0984	.18	214.81	4.52	-.13	229.4000	8.5370	.03	1217.	1217.	1217.
15.000	120.6200	2.4462	.25	213.54	4.19	.05	196.9000	6.9270	.09	1207.	1207.	1207.
16.000	102.8300	1.8916	.26	212.42	4.23	.04	168.8000	5.7360	.22	1203.	1203.	1203.
17.000	87.5960	1.4658	.25	211.83	4.08	-.05	144.1000	4.5140	.31	1192.	1192.	1192.
18.000	74.6180	1.1487	.17	211.72	3.62	-.13	122.8000	3.3280	.33	1178.	1178.	1178.
19.000	63.5810	.9347	.10	211.93	3.31	-.16	104.5000	2.4410	.44	1163.	1163.	1163.
20.000	54.1810	.7814	-.09	212.37	3.06	-.07	88.8900	1.7500	.42	1143.	1143.	1143.
21.000	46.1830	.6870	-.18	212.84	3.15	-.19	75.6000	1.3270	.43	1087.	1087.	1087.
22.000	39.3870	.6204	-.28	213.40	3.27	-.17	64.3100	1.0350	.23	1066.	1066.	1066.
23.000	33.6130	.5727	-.32	213.87	3.30	-.21	54.7500	.8254	.25	1036.	1036.	1036.
24.000	28.7090	.5243	-.39	214.51	3.34	-.16	46.6300	.6914	-.04	1025.	1025.	1025.
25.000	24.5250	.4894	-.42	215.00	3.59	.17	39.7400	.6301	-.25	970.	970.	970.
26.000	20.9690	.4442	-.35	215.52	3.75	.00	33.9000	.5683	-.33	899.	899.	899.
27.000	17.9370	.4142	-.32	216.08	3.93	.12	28.9200	.5203	-.39	777.	777.	777.
28.000	15.3480	.3770	-.15	216.76	4.14	.28	24.6700	.4921	-.45	651.	651.	651.
29.000	13.1610	.3457	-.15	217.53	4.28	.37	21.0800	.4719	-.54	502.	502.	502.
30.000	11.3060	.3119	.07	218.54	4.56	.49	18.0200	.4472	-.77	319.	[illegible]	[illegible]

TABLE II. 13 THERMODYNAMIC STATISTICAL PARAMETERS, ANNUAL
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	MEAN P MB	S.D. P MB	SKEW P	MEAN T DEG K	S.D. T DEG K	SKEW T	MEAN D G/M3	S.D. D G/M3	SKEW D	NOBS P	NOBS T	NOBS D
.000	1015.6000	10.8630	.46	292.33	14.77	.23	1209.0000	73.6100	.17	13967.	13967.	13967.
1.000	902.2500	6.3847	.19	286.26	12.19	.28	1097.0000	51.1400	.05	13967.	13967.	13967.
1.288	871.7100	5.8259	-.04	284.52	11.67	.28	1066.0000	46.5000	.03	14599.	14599.	14599.
2.000	800.1800	5.4983	-.64	281.32	10.21	.01	990.0000	35.0900	.16	14598.	14598.	14598.
3.000	707.7800	6.6001	-.57	274.32	9.44	-.07	898.1000	25.8800	.21	14596.	14596.	14596.
4.000	624.0800	8.0486	-.41	267.56	8.43	-.20	812.0000	17.3500	.34	14595.	14595.	14595.
5.000	548.6100	9.1622	-.37	260.77	7.79	.37	732.5000	11.5700	.62	14595.	14595.	14595.
6.000	480.6100	9.8825	-.36	253.92	7.71	-.41	659.2000	8.4080	.60	14593.	14593.	14593.
7.000	419.3700	10.2820	-.35	246.89	7.84	-.34	591.6000	6.5050	.37	14582.	14582.	14582.
8.000	[illegible].6800	10.5030	[illegible]	239.64	7.50	-.15	530.0000	5.1210	-.14	14572.	14572.	14572.
9.000	315.6800	10.4540	-.29	232.35	7.17	.05	473.2000	5.8210	-1.48	14564.	14564.	14564.
10.000	272.0300	10.0700	-.17	225.63	6.33	22	419.8000	8.7590	-1.82	14550.	14550.	14550.
11.000	233.6000	9.3293	-.04	220.54	5.62	.05	369.0000	12.2900	-1.28	14518.	14518.	14518.
12.000	199.9800	8.2268	.08	217.54	5.35	-.27	320.4000	14.3600	-.66	14481.	14481.	14481.
13.000	170.9900	7.0506	.19	216.19	4.75	-.36	275.7000	13.9700	-.17	14446.	14446.	14446.
14.000	146.0200	5.8669	.23	214.80	4.31	.03	237.0000	12.5300	.13	14400.	14400.	14400.
15.000	124.5700	4.7771	.22	213.15	4.55	04	203.8000	10.9500	.25	14343.	14343.	14343.
16.000	106.1600	3.8684	.21	212.08	4.61	-.01	174.5000	9.0310	.25	14295.	14295.	14295.
17.000	90.4410	3.1503	.19	211.99	4.05	-.04	148.7000	6.9020	.18	14190.	14190.	14190.
18.000	77.0700	2.6098	.18	212.54	3.36	-.15	126.4000	5.0770	.10	14088.	14088.	14088.
19.000	65.7330	2.2181	.18	213.51	2.98	-.40	107.3000	3.7160	.04	13954.	13954.	13954.
20.000	56.0960	1.9251	.17	214.52	2.98	-.54	91.0900	2.8530	.01	13807.	13807.	13807.
21.000	47.9270	1.6996	.16	215.61	3.17	-.59	77.4300	2.2540	.01	13336.	13336.	13336.
22.000	40.9600	1.5088	.15	216.64	3.42	-.64	65.8500	1.8450	.03	13012	13012	13012.
23.000	35.0550	1.3561	.13	217.72	3.68	-.61	56.0700	1.5450	.06	12736.	12736.	12736.
24.000	30.0140	1.2184	.12	218.86	3.96	-.57	47.7600	1.3230	.07	12542.	12542.	12542
25.000	25.7510	1.1068	.07	220.06	4.25	-.55	40.7500	1.1590	.01	12319.	12319.	12319.
26.000	22.0960	.9979	.05	221.26	4.54	-.52	34.7800	1.0190	-.03	11711.	11711.	11711.
27.000	18.9870	.9012	.02	222.59	4.87	-.49	29.7000	.9039	-.06	10693.	10693.	10693.
28.000	16.3190	.8075	.00	223.83	5.13	-.50	25.3900	.8045	-.08	9584.	9584.	9584.
29.000	14.0630	.7225	-.04	225.33	5.34	-.51	21.7300	.7220	-.13	8203.	8203.	8203.
30.000	12.1480	.6455	-.10	227.05	5.45	-.56	18.6330	.6562	-.22	6659.	6659.	[illegible]

TABLE III.1 MOISTURE RELATED STATISTICAL PARAMETERS, JANUARY

STATION = 725720 DUGWAY (SALT LAKE CITY)

Z	VAPOR P MEAN	S.D. VP	SKEW VP	TV MEAN	TV S.D.	SKEW TV	DEWPT T MEAN	S.D. DPT	SKEW DPT	NOBS T+P	NOBS TV
KM	MB	MB		DEG K	DEG K		DEG K	DEG K			
.000	6.056	3.041	.35	277.07	10.01	-.61	271.10	8.33	-.89	1160.	1160.
1.000	4.325	1.745	.34	273.03	7.11	-.45	267.40	6.00	-.80	1160.	1160.
1.288	3.903	1.502	.34	271.76	6.48	-.39	266.18	5.61	-.81	1238.	1278.
2.000	2.894	1.292	.78	270.59	5.97	-.29	262.15	5.89	-.36	1224.	1238.
3.000	2.104	1.094	.77	265.32	6.21	-.34	257.76	6.65	-.44	1160.	1237.
4.000	1.344	.818	.99	260.10	6.18	-.41	251.97	7.59	-.34	1129.	1237.
5.000	.772	.521	1.30	254.15	6.25	-.43	245.50	7.70	-.30	1117.	1237.
6.000	.425	.303	1.71	247.59	6.25	-.42	239.21	7.29	-.18	1071.	1235.
7.000	.225	.147	1.72	240.55	6.06	-.31	233.29	6.30	-.25	910	1236.
8.000	.131	.068	1.28	233.40	5.48	-.06	228.89	4.75	-.13	485.	1235.
9.000	.091	.042	.84	226.36	4.46	.26	225.88	4.00	.15	45.	1234.
10.000	99.999	99.999	999.99	220.24	3.77	.39	999.99	99.99	999.99	0	1233.
11.000	99.999	99.999	999.99	216.24	4.76	.67	999.99	99.99	999.99	0.	1229.
12.000	99.999	99.999	999.99	215.21	6.16	.22	999.99	99.99	999.99	0.	1227.
13.000	99.999	99.999	999.99	215.97	5.65	-.38	999.99	99.99	999.99	0.	1222
14.000	99.999	99.999	999.99	215.67	4.44	-.18	999.99	99.99	999.99	0.	1221.
15.000	99.999	99.999	999.99	214.37	4.31	.01	999.99	99.99	999.99	0.	1214.
16.000	99.999	99.999	999.99	213.03	4.54	-.01	999.99	99.99	999.99	0.	1210.
17.000	99.999	99.999	999.99	212.45	4.49	-.36	999.99	99.99	999.99	0.	1192.
18.000	99.999	99.999	999.99	212.48	4.09	-.42	999.99	99.99	999.99	0.	1177.
19.000	99.999	99.999	999.99	212.77	3.78	-.46	999.99	99.99	999.99	0.	1159.
20.000	99.999	99.999	999.99	213.29	3.67	-.46	999.99	99.99	999.99	0.	1147.
21.000	99.999	99.999	999.99	213.84	3.64	-.46	999.99	99.99	999.99	0.	1100.
22.000	99.999	99.999	999.99	214.40	3.78	-.46	999.99	99.99	999.99	0.	1075.
23.000	99.999	99.999	999.99	214.93	3.92	-.53	999.99	99.99	999.99	0.	1049.
24.000	99.999	99.999	999.99	215.70	3.97	-.38	999.99	99.99	999.99	0.	1010.
25.000	99.999	99.999	999.99	216.50	4.00	-.16	999.99	99.99	999.99	0.	907.
26.000	99.999	99.999	999.99	217.33	4.08	.10	999.99	99.99	999.99	0.	907.
27.000	99.999	99.999	999.99	219.14	4.24	.13	999.99	99.99	999.99	0.	815.
28.000	99.999	99.999	999.99	219.05	4.47	.09	999.99	99.99	999.99	0.	719.
29.000	99.999	99.999	999.99	220.28	4.53	.02	999.99	99.99	999.99	0.	571.
30.000	99.999	99.999	999.99	221.74	4.64	.17	999.99	99.99	999.99	0.	443.

TABLE III. 2 MOISTURE RELATED STATISTICAL PARAMETERS, FEBRUARY

STATION = 725720 DUGWAY (SALT LAKE CITY)

Z	VAPOR P MEAN	S.D. VP	SKEW VP	TV MEAN	TV S.D.	SKEW TV	DEWPT T MEAN	S.D. DPT	SKEW DPT	NOBS T+P	NOBS TV
KM	MB	MB		DEG K	DEG K		DEG K	DEG K			
.000	7.793	3.118	.36	283.05	9.14	-.38	275.40	6.36	-.79	1091.	1091.
1.000	5.153	1.638	.46	277.29	6.56	-.08	270.21	4.47	-.43	1091.	1091.
1.288	4.543	1.405	.44	275.54	6.05	-.01	268.56	4.31	-.50	1129	1129.
2.000	3.086	1.168	.66	272.46	5.22	.00	263.30	4.96	-.29	1118.	1129
3.000	2.069	.955	.63	265.96	5.34	-.20	257.90	6.06	-.45	1091.	1129.
4.000	1.223	.715	.99	260.13	5.33	-.38	251.12	7.01	-.23	1046.	1129
5.000	.688	.457	1.41	253.81	5.43	-.50	244.49	7.08	-.02	1014.	1129
6.000	.363	.267	2.11	246.89	5.51	-.44	237.75	6.83	.08	[illegible]	[illegible]
7.000	.195	.143	2.17	239.54	5.48	-.36	231.75	6.35	.10	800.	[illegible]
8.000	.124	.078	1.97	232.26	5.05	-.17	228.09	5.29	.02	376.	[illegible]
9.000	.126	.074	.29	225.21	4.15	.10	226.03	6.03	-.23	12.	[illegible]
10.000	99.999	99.999	999.99	219.40	3.67	.57	999.99	99.99	999.99	1.	1125.
11.000	99.999	99.999	999.99	216.24	5.17	.64	999.99	99.99	999.99	0.	[illegible]
12.000	99.999	99.999	999.99	216.21	6.43	-.15	999.99	99.99	999.99	0.	[illegible]
13.000	99.999	99.999	999.99	217.29	5.04	-.75	999.99	99.99	999.99	0.	[illegible]
14.000	99.999	99.999	999.99	216.82	3.81	-.28	999.99	99.99	999.99	0.	[illegible]
15.000	99.999	99.999	999.99	215.37	3.75	-.16	999.99	99.99	999.99	0.	[illegible]
16.000	99.999	99.999	999.99	214.11	3.98	-.26	999.99	99.99	999.99	0.	[illegible]
17.000	99.999	99.999	999.99	213.31	3.98	-.50	999.99	99.99	999.99	0.	[illegible]
18.000	99.999	99.999	999.99	213.06	3.79	-.45	999.99	99.99	999.99	0.	1043
19.000	99.999	99.999	999.99	213.31	3.56	-.38	999.99	99.99	999.99	0.	[illegible]
20.000	99.999	99.999	999.99	213.82	3.59	-.37	999.99	99.99	999.99	0.	[illegible]
21.000	99.999	99.999	999.99	214.31	3.72	-.26	999.99	99.99	999.99	0.	[illegible]
22.000	99.999	99.999	999.99	214.87	3.86	-.26	999.99	99.99	999.99	0.	968
23.000	99.999	99.999	999.99	215.51	3.86	-.15	999.99	99.99	999.99	0.	[illegible]
24.000	99.999	99.999	999.99	216.29	3.97	-.18	999.99	99.99	999.99	0.	[illegible]
25.000	99.999	99.999	999.99	217.12	4.02	-.19	999.99	99.99	999.99	0.	[illegible]
26.000	99.999	99.999	999.99	218.08	4.11	-.09	999.99	99.99	999.99	0.	[illegible]
27.000	99.999	99.999	999.99	219.17	4.16	.03	999.99	99.99	999.99	[illegible]	[illegible]
28.000	99.999	99.999	999.99	220.28	4.29	.07	999.99	99.99	999.99	0.	[illegible]
29.000	99.999	99.999	999.99	221.44	4.43	-.02	999.99	99.99	999.99	0	[illegible]
30.000	99.999	99.999	999.99	222.73	4.56	-.01	999.99	99.99	999.99	0.	[illegible]

TABLE III. 3 MOISTURE RELATED STATISTICAL PARAMETERS. MARCH
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	VAPOR P MEAN MB	S.D. VP MB	SKEW VP	TV MEAN DEG K	TV S.D. DEG K	SKEW TV	DEWPT T MEAN DEG K	S.D. DPT DEG K	SKEW DPT	NOBS T+P	NOBS TV
.000	8.964	3.140	.43	288.48	9.48	.08	277.72	5.31	-.45	1205.	1205.
1.000	5.607	1.717	.44	281.27	7.26	.23	271.40	4.31	-.34	1205.	1205.
1.288	4.876	1.498	.39	279.21	6.80	.24	269.51	4.28	-.39	1232.	1232.
2.000	3.190	1.165	.54	274.51	5.86	.13	263.76	4.85	-.32	1221.	1231.
3.000	2.129	.921	.47	267.12	5.72	-.08	258.38	5.73	-.48	1205.	1231.
4.000	1.276	.693	.71	260.57	5.38	-.37	251.76	6.80	-.37	1145.	1231.
5.000	.697	.435	1.03	254.06	5.31	-.53	244.73	6.99	-.16	1099.	1231.
6.000	.366	.250	1.46	247.10	5.44	-.55	237.91	6.77	-.04	1048.	1231.
7.000	.190	.127	1.67	239.73	5.50	-.50	231.73	6.12	-.08	904.	1227.
8.000	.110	.063	1.15	232.37	5.01	-.17	227.03	5.51	-.72	446.	1226.
9.000	.095	.039	-.01	225.33	4.14	.07	226.31	4.15	-.62	21.	1226.
10.000	99.999	99.999	999.99	219.73	3.59	.26	999.99	99.99	999.99	0.	[illegible]
11.000	99.999	99.999	999.99	216.76	4.75	.51	999.99	99.99	999.99	0.	1219.
12.000	99.999	99.999	999.99	216.63	6.13	-.17	999.99	99.99	999.99	0.	1215.
13.000	99.999	99.999	999.99	217.61	5.04	-.65	999.99	99.99	999.99	0.	1211.
14.000	99.999	99.999	999.99	217.26	3.81	-.18	999.99	99.99	999.99	0.	1208.
15.000	99.999	99.999	999.99	216.11	3.54	-.04	999.99	99.99	999.99	0.	1202.
16.000	99.999	99.999	999.99	215.12	3.57	-.28	999.99	99.99	999.99	0.	1197.
17.000	99.999	99.999	999.99	214.64	3.38	-.38	999.99	99.99	999.99	0.	1199.
18.000	99.999	99.999	999.99	214.41	3.06	-.45	999.99	99.99	999.99	0.	1179.
19.000	99.999	99.999	999.99	214.48	2.88	-.46	999.99	99.99	999.99	0.	1165.
20.000	99.999	99.999	999.99	214.84	2.82	-.33	999.99	99.99	999.99	0.	1154.
21.000	99.999	99.999	999.99	215.40	2.85	-.09	999.99	99.99	999.99	0.	1107.
22.000	99.999	99.999	999.99	216.01	2.95	.11	999.99	99.99	999.99	0.	[illegible]
23.000	99.999	99.999	999.99	216.69	2.96	.20	999.99	99.99	999.99	0.	1059.
24.000	99.999	99.999	999.99	217.35	3.12	.23	999.99	99.99	999.99	0.	1045.
25.000	99.999	99.999	999.99	218.13	3.32	.18	999.99	99.99	999.99	0.	1007.
26.000	99.999	99.999	999.99	219.10	3.52	.23	999.99	99.99	999.99	0.	939.
27.000	99.999	99.999	999.99	220.25	3.69	.28	999.99	99.99	999.99	0.	846.
28.000	99.999	99.999	999.99	221.46	3.78	.29	999.99	99.99	999.99	0.	744.
29.000	99.999	99.999	999.99	222.74	3.83	.23	999.99	99.99	999.99	0.	624.
30.000	99.999	99.999	999.99	224.46	4.10	.21	999.99	99.99	999.99	0.	505

TABLE III. 4 MOISTURE RELATED STATISTICAL PARAMETERS. APRIL
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	VAPOR P MEAN MB	S.D. VP MB	SKEW VP	TV MEAN DEG K	TV S.D. DEG K	SKEW TV	DEWPT T MEAN DEG K	S.D. DPT DEG K	SKEW DPT	NOBS T+P	NOBS TV
.000	10.284	3.170	.43	293.21	9.77	.24	279.90	4.66	-.32	1178.	1178.
1.000	6.378	1.755	.49	285.46	7.45	.43	273.28	3.89	-.31	1178.	1178.
1.288	5.546	1.549	.43	283.34	6.95	.46	271.35	3.93	-.39	1202.	1202.
2.000	3.711	1.195	.51	278.36	5.80	.31	265.89	4.28	-.23	1177.	1202.
3.000	2.517	.884	.43	270.43	5.50	.17	260.34	4.62	-.46	1178.	1202.
4.000	1.506	.703	.51	263.20	5.10	-.13	254.07	6.06	-.53	1152.	1202.
5.000	.828	.477	.77	256.30	4.87	-.38	246.75	6.32	-.37	1107.	1202
6.000	.413	.265	1.22	249.24	4.94	-.48	239.23	6.78	-.22	[illegible]	[illegible]
7.000	.210	.136	1.50	241.89	4.91	-.47	232.57	6.46	-.45	978.	1202
8.000	.116	.071	1.45	234.57	4.63	-.39	227.32	5.68	-.41	600.	1200
9.000	.113	.042	.06	227.47	3.90	-.15	227.97	3.76	-.56	17.	1193.
10.000	99.999	99.999	999.99	221.57	3.25	.01	999.99	99.99	999.99	0.	1197
11.000	99.999	99.999	999.99	217.77	4.25	.69	999.99	99.99	999.99	0.	1197
12.000	99.999	99.999	999.99	216.64	5.77	.14	999.99	99.99	999.99	0.	1194
13.000	99.999	99.999	999.99	217.30	5.28	-.53	999.99	99.99	999.99	0.	[illegible]
14.000	99.999	99.999	999.99	217.29	3.85	-.26	999.99	99.99	999.99	0.	[illegible]
15.000	99.999	99.999	999.99	216.39	3.48	.03	999.99	99.99	999.99	0.	1182
16.000	99.999	99.999	999.99	215.64	3.47	-.02	999.99	99.99	999.99	0	1179
17.000	99.999	99.999	999.99	215.13	3.15	-.21	999.99	99.99	999.99	0.	[illegible]
18.000	99.999	99.999	999.99	214.83	2.81	-.31	999.99	99.99	999.99	0.	1159
19.000	99.999	99.999	999.99	214.87	2.49	-.03	999.99	99.99	999.99	0.	[illegible]
20.000	99.999	99.999	999.99	215.24	2.43	.20	999.99	99.99	999.99	0.	[illegible]
21.000	99.999	99.999	999.99	215.82	2.47	.15	999.99	99.99	999.99	0.	[illegible]
22.000	99.999	99.999	999.99	216.57	2.46	.10	999.99	99.99	999.99	0.	1086
23.000	99.999	99.999	999.99	217.40	2.48	.11	999.99	99.99	999.99	0.	[illegible]
24.000	99.999	99.999	999.99	218.32	2.50	.17	999.99	99.99	999.99	0.	[illegible]
25.000	99.999	99.999	999.99	219.27	2.48	.08	999.99	99.99	999.99	0.	994
26.000	99.999	99.999	999.99	220.46	2.48	.03	999.99	99.99	999.99	0	951
27.000	99.999	99.999	999.99	[illegible]	[illegible]	.10	999.99	99.99	999.99	0	881
28.000	99.999	99.999	999.99	223.10	2.74	.16	999.99	99.99	999.99	0.	[illegible]
29.000	99.999	99.999	999.99	224.74	2.90	.08	999.99	99.99	999.99	0	[illegible]
30.000	99.999	99.999	999.99	226.69	3.14	-.09	999.99	99.99	999.99	0	[illegible]

TABLE III. 5 MOISTURE RELATED STATISTICAL PARAMETERS, MAY
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	VAPOR P MEAN MB	S.D. VP MB	SKEW VP	TV MEAN DEG K	TV S.D. DEG K	SKEW TV	DEWPT T MEAN DEG K	S.D. DPT DEG K	SKEW DPT	NOBS T+P	NOBS TV
.000	12.333	3.990	.44	298.38	11.50	.15	282.51	4.98	-.25	1207.	1207.
1.000	7.956	2.132	.41	290.97	8.55	.24	276.38	3.93	-.43	1207.	1207.
1.288	6.966	1.899	.31	289.02	7.89	.22	274.49	4.00	-.55	1241.	1241.
2.000	4.670	1.352	.46	284.66	6.08	-.27	269.01	3.99	-.39	1205.	1241.
3.000	3.235	1.065	.51	276.62	5.69	-.37	264.09	4.37	-.39	1207.	1241.
4.000	2.087	.850	.47	268.84	5.05	-.52	258.26	5.41	-.58	1199.	1241.
5.000	1.197	.623	.66	261.41	4.54	-.72	251.16	6.51	-.44	1171.	1241.
6.000	.594	.358	1.15	254.22	4.51	-.75	243.24	6.48	-.19	1126.	1241.
7.000	.285	.178	1.62	246.88	4.65	-.77	235.86	5.80	.04	1087.	1241.
8.000	.141	.081	1.43	239.36	4.54	-.65	229.40	5.03	.09	924.	1240.
9.000	.080	.044	1.46	231.76	4.12	-.39	224.47	4.45	.21	249.	1239.
10.000	99.999	99.999	999.99	224.68	3.36	-.17	999.99	99.99	999.99	0.	[illegible]
11.000	99.999	99.999	999.99	219.04	3.61	.54	999.99	99.99	999.99	0.	1236.
12.000	99.999	99.999	999.99	215.98	4.90	.66	999.99	99.99	999.99	0.	1233.
13.000	99.999	99.999	999.99	215.70	5.38	.00	999.99	99.99	999.99	0.	1232.
14.000	99.999	99.999	999.99	216.17	4.47	-.41	999.99	99.99	999.99	0.	1225.
15.000	99.999	99.999	999.99	215.82	3.70	-.16	999.99	99.99	999.99	0.	1223.
16.000	99.999	99.999	999.99	215.09	3.42	-.27	999.99	99.99	999.99	0.	1221.
17.000	99.999	99.999	999.99	214.60	2.99	-.36	999.99	99.99	999.99	0.	1217.
18.000	99.999	99.999	999.99	214.55	2.55	-.16	999.99	99.99	999.99	0.	1209.
19.000	99.999	99.999	999.99	215.08	2.13	.02	999.99	99.99	999.99	0.	1202.
20.000	99.999	99.999	999.99	215.86	2.01	.20	999.99	99.99	999.99	0.	119[illegible].
21.000	99.999	99.999	999.99	216.99	1.99	.39	999.99	99.99	999.99	0.	1147.
22.000	99.999	99.999	999.99	218.13	1.94	.35	999.99	99.99	999.99	0.	1134.
23.000	99.999	99.999	999.99	219.38	1.94	.39	999.99	99.99	999.99	0.	1115.
24.000	99.999	99.999	999.99	220.77	2.03	.37	999.99	99.99	999.99	0.	1095.
25.000	99.999	99.999	999.99	222.19	2.10	.31	999.99	99.99	999.99	0.	1094.
26.000	99.999	99.999	999.99	223.66	2.13	.20	999.99	99.99	999.99	0.	1040.
27.000	99.999	99.999	999.99	225.26	2.25	.25	999.99	99.99	999.99	0.	931.
28.000	99.999	99.999	999.99	226.95	2.32	.32	999.99	99.99	999.99	0.	863.
29.000	99.999	99.999	999.99	228.71	2.41	.45	999.99	99.99	999.99	0.	757.
30.000	99.999	99.999	999.99	230.55	2.35	.13	999.99	99.99	999.99	0.	[illegible]

TABLE III. 6 MOISTURE RELATED STATISTICAL PARAMETERS, JUNE
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	VAPOR P MEAN MB	S.D. VP MB	SKEW VP	TV MEAN DEG K	TV S.D. DEG K	SKEW TV	DEWPT T MEAN DEG K	S.D. DPT DEG K	SKEW DPT	NOBS T+P	NOBS TV
.000	14.271	4.560	.46	303.73	12.45	.11	284.71	5.02	-.29	1147.	1147.
1.000	9.454	2.537	.36	296.37	9.06	.20	278.93	4.07	-.57	1147.	1147.
1.288	8.312	2.336	.25	294.47	8.31	.20	276.93	4.28	-.67	1195.	1195.
2.000	5.959	1.555	.54	290.34	5.77	-.20	272.40	3.61	-.17	1141.	1195.
3.000	4.162	1.212	.53	282.23	5.38	-.30	267.50	3.90	-.24	1147.	1194.
4.000	2.765	1.035	.49	274.28	4.69	-.36	261.90	5.03	-.57	1153.	1194.
5.000	1.666	.814	.47	266.62	4.05	-.45	255.28	6.44	-.62	1130.	1194.
6.000	.863	.530	1.05	259.40	3.86	-.47	247.15	6.89	-.16	1075.	1194.
7.000	.409	.279	1.67	252.30	3.98	-.46	239.18	6.56	-.11	1031.	1192.
8.000	.197	.130	1.83	244.84	4.00	-.41	232.12	6.11	-.42	999.	1191.
9.000	.095	.065	4.41	237.08	3.93	-.36	225.63	5.39	-.38	687.	1191.
10.000	.052	.030	1.96	223.42	3.59	-.18	220.86	4.43	-.49	98.	1191.
11.000	99.999	99.999	999.99	222.82	3.27	.26	999.99	99.99	999.99	0.	1189.
12.000	99.999	99.999	999.99	218.30	3.87	.49	999.99	99.99	999.99	0.	1187.
13.000	99.999	99.999	999.99	216.41	4.49	-.01	999.99	99.99	999.99	0.	1166
14.000	99.999	99.999	999.99	215.36	4.18	-.19	999.99	99.99	999.99	0.	1165.
15.000	99.999	99.999	999.99	213.95	4.02	-.20	999.99	99.99	999.99	0.	1160.
16.000	99.999	99.999	999.99	212.83	3.87	-.32	999.99	99.99	999.99	0.	1179.
17.000	99.999	99.999	999.99	212.54	3.41	-.39	999.99	99.99	999.99	0.	1176.
18.000	99.999	99.999	999.99	213.27	2.55	-.08	999.99	99.99	999.99	0.	1171
19.000	99.999	99.999	999.99	214.83	2.01	.01	999.99	99.99	999.99	0.	1163.
20.000	99.999	99.999	999.99	216.34	1.74	.12	999.99	99.99	999.99	0.	1156.
21.000	99.999	99.999	999.99	217.83	1.57	.13	999.99	99.99	999.99	0.	1125.
22.000	99.999	99.999	999.99	219.36	1.38	-.01	999.99	99.99	999.99	0.	1097.
23.000	99.999	99.999	999.99	220.91	1.38	.04	999.99	99.99	999.99	0.	1077.
24.000	99.999	99.999	999.99	222.50	1.48	-.03	999.99	99.99	999.99	0.	1053.
25.000	99.999	99.999	999.99	224.10	1.52	-.01	999.99	99.99	999.99	0.	10[illegible]
26.000	99.999	99.999	999.99	225.75	1.59	.00	999.99	99.99	999.99	0.	1018
27.000	99.999	99.999	999.99	227.43	1.76	.01	999.99	99.99	999.99	0.	[illegible]
28.000	99.999	99.999	999.99	229.09	1.81	-.06	999.99	99.99	999.99	0.	850.
29.000	99.999	99.999	999.99	230.85	1.99	-.01	999.99	99.99	999.99	0.	738.
30.000	99.999	99.999	999.99	232.66	2.05	-.21	999.99	99.99	999.99	0.	626.

TABLE III. 7 MOISTURE RELATED STATISTICAL PARAMETERS, JULY
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z	VAPOR P	S.D. VP	SKEW VP	TV	TV	SKEW TV	DEWPT T	S.D. DPT	SKEW DPT	NOBS T+P	NOBS TV
	MEAN			MEAN	S.D.		MEAN				
KM	MB	MB		DEG K	DEG K		DEG K	DEG K			
.000	16.040	5.593	.48	309.67	12.77	-.14	286.35	5.57	-.28	1162.	1162.
1.000	10.863	3.356	.42	302.28	8.71	-.10	280.69	4.78	-.52	1162.	1162.
1.288	9.530	3.104	.37	300.22	7.70	-.08	278.70	5.02	-.57	1243.	1243.
2.000	7.195	2.052	.78	296.24	3.41	-.56	274.92	3.92	.08	1139.	1243.
3.000	5.045	1.677	.72	288.04	2.79	-.69	269.91	4.45	-.05	1162.	1243.
4.000	3.580	1.357	.63	279.55	2.33	-.56	265.20	4.99	-.17	1188.	1243.
5.000	2.412	1.041	.44	271.15	2.12	-.45	259.91	5.75	-.41	1174.	1243.
6.000	1.330	.758	.59	263.67	2.31	-.32	252.06	7.12	-.21	1100.	1243.
7.000	.626	.442	1.29	256.92	2.51	-.36	243.39	7.00	.31	1030.	1242.
8.000	.310	.227	1.46	249.83	2.67	-.29	236.14	6.71	.21	974.	1241.
9.000	.145	.105	1.60	242.43	2.83	-.31	229.04	6.23	-.01	937.	1241.
10.000	.072	.048	1.30	234.56	2.52	-.25	[illegible]	5.67	[illegible]	[illegible]	1240.
11.000	.047	.028	.88	227.77	2.72	-.25	219.43	6.30	-1.08	10.	1237.
12.000	99.999	99.999	999.99	221.49	2.40	-.31	999.99	99.99	999.99	0.	1235.
13.000	99.999	99.999	999.99	216.45	2.47	.15	999.99	99.99	999.99	0.	1233.
14.000	99.999	99.999	999.99	212.20	2.90	.62	999.99	99.99	999.99	0.	1229.
15.000	99.999	99.999	999.99	209.00	3.29	.58	999.99	99.99	999.99	0.	1226.
16.000	99.999	99.999	999.99	207.93	3.11	.25	999.99	99.99	999.99	0.	1222.
17.000	99.999	99.999	999.99	209.16	2.52	.11	999.99	99.99	999.99	0.	1219.
18.000	99.999	99.999	999.99	211.51	2.13	.12	999.99	99.99	999.99	0.	1218.
19.000	99.999	99.999	999.99	214.16	1.82	.09	999.99	99.99	999.99	0.	1209.
20.000	99.999	99.999	999.99	216.25	1.59	-.09	999.99	99.99	999.99	0.	1198.
21.000	99.999	99.999	999.99	218.25	1.45	-.12	999.99	99.99	999.99	0.	1180.
22.000	99.999	99.999	999.99	219.91	1.31	-.07	999.99	99.99	999.99	0.	1129.
23.000	99.999	99.999	999.99	221.54	1.34	-.17	999.99	99.99	999.99	0.	1111.
24.000	99.999	99.999	999.99	223.11	1.34	-.10	999.99	99.99	999.99	0.	1091.
25.000	99.999	99.999	999.99	224.63	1.36	.01	999.99	99.99	999.99	0.	1112.
26.000	99.999	99.999	999.99	226.23	1.41	-.03	999.99	99.99	999.99	0.	1050.
27.000	99.999	99.999	999.99	227.92	1.61	.00	999.99	99.99	999.99	0.	[illegible]
28.000	99.999	99.999	999.99	229.46	1.64	-.08	999.99	99.99	999.99	0.	859.
29.000	99.999	99.999	999.99	231.01	1.84	-.08	999.99	99.99	999.99	0.	[illegible]
30.000	99.999	99.999	999.99	232.68	1.96	-.11	999.99	99.99	999.99	0.	645.

TABLE III. 8 MOISTURE RELATED STATISTICAL PARAMETERS, AUGUST
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z	VAPOR P	S.D. VP	SKEW VP	TV	TV	SKEW TV	DEWPT T	S.D. DPT	SKEW DPT	NOBS T+P	NOBS TV
	MEAN			MEAN	S.D.		MEAN				
KM	MB	MB		DEG K	DEG K		DEG K	DEG K			
.000	16.177	6.026	.55	308.03	12.61	-.11	286.36	5.96	-.26	1192.	1192.
1.000	10.937	3.627	.48	300.74	8.75	-.08	280.70	5.04	-.30	1192.	1192.
1.288	9.699	3.277	.47	298.65	7.79	-.08	278.92	5.10	-.35	1238.	1238.
2.000	7.236	2.244	.68	294.84	4.24	-.88	274.93	4.29	.06	1190.	1238.
3.000	5.159	1.802	.55	286.66	3.75	-1.12	270.13	4.76	-.07	1192.	1238
4.000	3.629	1.392	.41	278.33	3.18	-1.09	265.31	5.25	-.36	1191.	[illegible]
5.000	2.356	1.074	.42	270.30	2.67	-.79	259.47	6.14	-.41	1171.	[illegible]
6.000	1.271	.769	.72	263.12	2.62	-.55	251.37	7.37	-.12	1098.	[illegible]
7.000	.600	.431	1.37	256.46	2.81	-.41	242.84	7.16	.25	1026.	[illegible]
8.000	.293	.210	1.53	249.35	2.96	-.34	235.66	6.54	.21	983.	[illegible]
9.000	.142	.099	1.65	241.88	3.12	-.17	228.95	6.00	.05	950.	1235.
10.000	.069	.045	1.39	234.32	3.22	-.16	222.78	5.51	-.23	393.	1234
11.000	.043	.020	.43	227.19	3.06	-.19	219.47	4.10	-.36	12.	[illegible]
12.000	99.999	99.999	999.99	221.15	2.72	-.25	999.99	99.99	999.99	0.	[illegible]
13.000	99.999	99.999	999.99	216.50	2.35	.37	999.99	99.99	999.99	0.	[illegible]
14.000	99.999	99.999	999.99	212.57	2.81	.51	999.90	99.99	999.99	0.	[illegible]
15.000	99.999	99.999	999.99	209.62	3.43	.47	999.99	99.99	999.99	0.	1224.
16.000	99.999	99.999	999.99	208.35	3.52	.27	999.99	99.99	999.99	0.	1217.
17.000	99.999	99.999	999.99	209.51	2.90	.35	999.99	99.99	999.99	0.	1208
18.000	99.999	99.999	999.99	211.60	2.34	.29	999.99	99.99	999.99	0.	[illegible]
19.000	99.999	99.999	999.99	214.16	2.00	.33	999.99	99.99	999.99	0.	1168
20.000	99.999	99.999	999.99	216.18	1.72	.17	999.99	99.99	999.99	0.	[illegible]
21.000	99.999	99.999	999.99	218.05	1.50	.10	999.99	99.99	999.99	0	[illegible]
22.000	99.999	99.999	999.99	219.59	1.44	-.01	999.99	99.99	999.99	0.	[illegible]
23.000	99.999	99.999	999.99	221.06	1.47	-.01	999.99	99.99	999.99	0.	[illegible]
24.000	99.999	99.999	999.99	222.50	1.47	-.05	999.99	99.99	999.99	0	[illegible]
25.000	99.999	99.999	999.99	223.98	1.49	-.03	999.99	99.99	999.99	0.	1067
26.000	99.999	99.999	999.99	225.44	1.54	.07	999.99	99.99	999.99	0.	[illegible]
27.000	99.999	99.999	999.99	226.96	1.70	-.01	999.99	99.99	999.99	0.	[illegible]
28.000	99.999	99.999	999.99	228.28	1.78	-.18	999.99	99.99	999.99	0.	[illegible]
29.000	99.999	99.999	999.99	229.68	1.92	-.26	999.99	99.99	999.99	0.	787.
30.000	99.999	99.999	999.99	231.11	1.93	-.05	999.99	99.99	999.99	0.	[illegible]

TABLE III. 9 MOISTURE RELATED STATISTICAL PARAMETERS, SEPTEMBER
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z	VAPOR P	S.D. VP	SKEW VP	TV	TV	SKEW TV	DEWPT T	S.D. DPT	SKEW DPT	NOBS T+P	NOBS TV
	MEAN			MEAN	S.D.		MEAN				
KM	MB	MB		DEG K	DEG K		DEG K	DEG K			
.000	13.426	5.130	.68	301.82	12.71	-.10	283.52	5.84	-.12	1141.	1141.
1.000	9.052	2.990	.74	294.94	9.15	-.03	278.00	4.75	-.09	1141.	1141.
1.289	7.993	2.688	.69	292.96	8.31	-.03	276.20	4.82	-.18	1199.	1200.
2.000	5.828	2.050	.95	289.48	5.62	-.66	271.78	4.78	-.09	1147.	1200
3.000	4.096	1.594	.62	281.68	5.17	-.90	266.87	5.31	-.32	1143.	1200.
4.000	2.748	1.266	.64	273.99	4.40	-1.07	261.38	6.22	-.46	1124.	1200.
5.000	1.637	.919	.82	266.83	3.89	-1.10	254.60	6.97	-.21	1079.	1200.
6.000	.823	.547	1.42	260.09	3.86	-1.11	246.49	6.99	.09	1008.	1200.
7.000	.400	.280	1.89	253.14	3.79	-1.06	238.96	6.42	.17	970.	1200.
8.000	.200	.141	1.98	245.75	3.66	-.92	232.17	6.05	.10	922.	1200.
9.000	.098	.067	1.86	238.[illegible]	3.40	-.54	225.74	5.60	-.07	746.	1200.
10.000	.049	.030	[illegible]	[illegible]	[illegible]	.03	[illegible]	[illegible]	[illegible]	106.	1199.
11.000	99.999	99.999	999.99	224.26	3.16	.22	999.93	99.99	999.99	1.	1195.
12.000	99.999	99.999	999.99	219.72	3.46	.09	999.99	99.99	999.99	0.	1193.
13.000	99.993	99.999	999.99	216.62	3.33	.05	999.99	99.99	999.99	0.	1190.
14.000	99.999	99.999	999.99	213.77	3.33	.41	999.99	99.99	999.99	0.	1189.
15.000	99.999	99.999	999.99	211.41	3.58	.41	999.99	99.99	999.93	0.	1104.
16.000	99.999	99.999	999.99	210.15	3.62	.32	999.99	99.99	999.99	0.	1179.
17.000	99.999	99.999	999.99	210.40	3.26	.34	999.99	99.99	999.99	0.	1172.
18.000	99.999	99.999	999.99	211.49	2.89	.38	999.99	99.99	999.99	0.	1167.
19.000	99.999	99.999	999.99	213.23	2.54	.29	999.99	99.99	999.99	0.	1159.
20.000	99.999	99.999	999.99	214.92	2.49	.11	999.99	99.99	999.99	0.	1148.
21.000	99.999	99.999	999.99	216.48	2.39	.07	999.99	99.99	999.99	0.	1112.
22.000	99.999	99.999	999.99	217.32	2.29	.03	999.93	99.99	999.99	0.	1094.
23.000	99.999	99.993	999.99	219.49	2.20	.06	999.99	99.99	999.93	0.	1070.
24.000	99.999	99.999	999.99	221.03	2.07	.00	999.99	99.99	999.99	0.	1057.
25.000	99.999	99.999	999.99	222.44	1.94	.04	999.99	99.99	999.99	0.	1060.
26.000	99.999	99.999	999.99	223.84	1.95	.05	999.99	99.99	999.99	0.	1022.
27.000	99.999	99.999	999.99	225.21	2.03	.07	999.99	99.99	999.99	0.	941.
28.000	99.999	99.999	999.99	226.38	2.05	-.02	999.99	99.99	999.99	0.	867.
29.000	99.999	99.999	999.99	227.61	2.26	.09	999.99	99.99	999.99	0.	771.
30.000	99.999	99.999	999.99	228.79	2.23	.04	999.99	99.99	999.99	0.	644.

TABLE III. 10 MOISTURE RELATED STATISTICAL PARAMETERS, OCTOBER
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z	VAPOR P	S.D. VP	SKEW VP	TV	TV	SKEW TV	DEWPT T	S.D. DPT	SKEW DPT	NOBS T+P	NOBS TV
	MEAN			MEAN	S.D.		MEAN				
KM	MB	MB		DEG K	DEG K		DEG K	DEG K			
.000	10.500	4.080	.47	293.66	11.94	-.02	279.81	5.98	-.32	1168.	1168.
1.000	7.185	2.143	.61	287.75	8.68	.14	274.86	4.22	-.19	1168.	1168.
1.288	6.407	1.844	.55	286.11	7.94	.16	273.30	4.04	-.25	1241.	1241.
2.000	4.456	1.447	58	283.34	6.09	-.44	268.27	4.41	-.27	1204.	1241.
3.000	3.086	1.204	.62	276.40	5.77	-.64	263.24	5.14	-.29	1168.	1241.
4.000	1.994	.968	.64	269.92	5.23	-.85	257.31	6.41	-.52	1126.	1241.
5.000	1.145	.657	.96	263.57	5.08	-.94	250.44	6.84	-.28	1083.	1241.
6.000	.615	.367	1.10	256.87	5.07	-1.01	243.56	6.62	-.30	1037	1241.
7.000	.329	.206	1.27	249.75	4.96	-1.05	237.09	6.40	-.26	1006.	1241.
8.000	.171	.106	1.47	242.28	4.72	-.90	230.86	5.82	-.23	910.	1241.
9.000	.091	.067	5.51	234.70	4.17	-.42	225.21	5.44	-.18	459.	1241.
10.000	.067	.043	.48	227.44	3.50	.02	221.92	7.14	-.75	20.	1239.
11.000	99.999	99.999	999.99	221.45	3.47	.44	999.99	99.99	999.99	2.	1237.
12.000	99.999	99.999	999.99	217.22	4.22	.44	999.99	99.99	999.99	0.	1235.
13.000	99.999	99.999	999.99	214.68	4.35	.12	999.99	99.99	999.99	0.	1230.
14.000	99.999	99.999	999.99	212.72	4.11	.14	999.99	99.99	999.99	0.	1229
15.000	99.999	99.999	999.99	210.79	4.06	.52	999.99	99.99	999.99	0.	122[illegible].
16.000	99.999	99.999	999.99	209.65	4.21	.42	999.99	99.99	999.99	0.	12[illegible].
17.000	99.939	99.999	999.99	209.06	3.82	.29	999.99	99.99	999.99	0.	1208.
18.000	99.999	99.999	999.99	210.66	3.24	.10	999.99	99.99	999.99	0.	120[illegible]
19.000	99.999	99.999	999.99	211.80	2.61	.16	999.99	99.99	999.99	0.	119[illegible].
20.000	99.999	99.999	993.99	213.04	2.33	.24	999.99	99.99	999.99	0.	1182.
21.000	99.999	99.999	999.99	214.34	2.23	.21	999.99	99.99	999.99	0.	1136.
22.000	99.999	99.999	999.99	215.49	2.24	.24	999.99	99.99	999.99	0.	111[illegible]
23.000	99.999	99.999	999.99	216.70	2.28	.18	999.99	99.99	999.99	0.	1094.
24.000	99.999	99.999	999.99	217.92	2.42	.13	999.99	99.99	999.99	0.	1083.
25.000	99.999	99.999	999.99	219.02	2.49	.18	999.99	99.99	999.99	0.	1077.
26.000	99.999	99.999	999.99	220.19	2.56	.13	999.99	99.99	999.99	0.	1046.
27.000	99.999	99.999	999.99	221.33	2.71	.10	999.99	99.99	999.99	0.	[illegible]
28.000	99.999	99.999	999.99	222.27	2.95	-.08	999.99	99.99	999.39	0.	900.
29.000	99.999	99.999	999.99	223.29	3.10	-.05	999.99	99.99	999.99	0.	793.
30.000	99.999	99.999	999.99	224.30	3.15	-.05	999.99	99.99	999.99	0.	668.

TABLE III. 11 MOISTURE RELATED STATISTICAL PARAMETERS. NOVEMBER
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	VAPOR P MEAN MB	S.D. VP MB	SKEW VP	TV MEAN DEG K	TV S.D. DEG K	SKEW TV	DEWPT T MEAN DEG K	S.D. DPT DEG K	SKEW DPT	NOBS T+P	NOBS TV
.000	8.683	3.317	.33	286.16	9.29	-.19	277.07	5.95	-.55	1155.	1155.
1.000	5.928	1.761	.51	280.67	6.75	.08	272.19	4.20	-.40	1155.	1155.
1.288	5.300	1.499	.52	279.01	6.20	.13	270.73	3.94	-.44	1202.	1202.
2.000	3.664	1.260	.49	276.11	5.70	-.05	265.63	4.63	-.34	1193.	1202.
3.000	2.507	1.110	.43	269.98	5.61	-.30	260.28	6.16	-.66	1155.	1202.
4.000	1.570	.887	.78	264.27	5.47	-.51	254.01	7.26	[illegible]	1106.	1202.
5.000	.927	.585	1.14	258.23	5.49	-.63	247.70	7.50	-.36	1078.	1202.
6.000	.530	.362	1.30	251.69	5.45	-.68	241.48	7.51	-.30	1051.	1202.
7.000	.284	.191	1.31	244.72	5.45	-.57	235.28	7.02	-.4[illegible]	1004.	1200.
8.000	.151	.091	1.59	237.55	5.17	-.37	229.83	5.71	-.56	763.	1200.
9.000	.097	.056	1.09	230.39	4.44	-.07	225.99	5.14	-.20	177.	1199.
10.000	99.999	99.999	999.99	223.89	3.75	.16	999.99	99.99	999.99	2.	[illegible]
11.000	99.999	99.999	999.99	218.89	4.04	.60	999.99	99.99	999.99	0.	1193.
12.000	99.999	99.999	999.99	215.94	4.93	.34	999.99	99.99	999.99	0.	1190.
13.000	99.999	99.999	999.99	214.48	5.03	-.23	999.99	99.99	999.99	0.	1189.
14.000	99.999	99.999	999.99	213.20	4.34	-.22	999.99	99.99	999.99	0.	1179.
15.000	99.999	99.999	999.99	211.71	4.24	-.02	999.99	99.99	999.99	0.	1175.
16.000	99.999	99.999	999.99	210.76	4.21	-.15	999.99	99.99	999.99	0.	1163.
17.000	99.999	99.999	999.99	210.69	3.72	-.13	999.99	99.99	999.99	0.	1157.
18.000	99.999	99.999	999.99	210.96	3.12	-.11	999.99	99.99	999.99	0	1149.
19.000	99.999	99.999	999.99	211.35	2.67	.04	999.99	99.99	999.99	0.	113[illegible].
20.000	99.999	99.999	999.99	211.85	2.44	-.16	999.99	99.99	999.99	0.	111[illegible].
21.000	99.999	99.999	999.99	212.52	2.29	-.12	999.99	99.99	999.99	0.	1055.
22.000	99.999	99.999	999.99	213.36	2.38	-.46	999.99	99.99	999.99	0.	1031.
23.000	99.999	99.999	999.99	214.34	2.41	-.33	999.99	99.99	999.99	0.	997.
24.000	99.999	99.999	999.99	215.36	2.60	-.36	999.99	99.99	999.99	0.	1003.
25.000	99.999	99.999	999.99	216.24	2.70	-.20	999.99	99.99	999.99	0.	970.
26.000	99.999	99.999	999.99	217.08	2.75	-.22	999.99	99.99	999.99	0.	934.
27.000	99.999	99.999	999.99	218.02	2.87	-.18	999.99	99.99	999.99	0.	843.
28.000	99.999	99.999	999.99	218.74	3.02	-.07	999.99	99.99	999.99	0.	759.
29.000	99.999	99.999	999.99	219.65	3.09	-.05	999.99	99.99	999.99	0.	608.
30.000	99.999	99.999	999.99	220.58	3.24	-.15	999.99	99.99	999.99	0.	442.

TABLE III. 12 MOISTURE RELATED STATISTICAL PARAMETERS. DECEMBER
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	VAPOR P MEAN MB	S.D. VP MB	SKEW VP	TV MEAN DEG K	TV S.D. DEG K	SKEW TV	DEWPT T MEAN DEG K	S.D. DPT DEG K	SKEW DPT	NOBS T+P	NOBS TV
.000	6.520	2.981	.38	278.55	9.01	-.57	272.53	7.31	-.84	1161.	1161.
1.000	4.670	1.649	.33	274.36	6.37	-.40	268.70	5.19	-.81	1161.	1161.
1.288	4.244	1.404	.30	273.04	5.79	-.30	267.54	4.78	-.81	1238.	1238.
2.000	2.997	1.163	.66	271.66	5.83	-.15	262.88	5.10	-.35	1228.	1239.
3.000	2.114	1.022	.67	266.44	6.16	-.32	258.04	6.33	-.42	1161.	1239.
4.000	1.336	.814	.89	261.20	6.14	-.51	251.94	7.45	-.24	1118.	1237.
5.000	.770	.523	1.19	255.24	6.26	-.63	245.47	7.63	-.17	1088.	1237.
6.000	.436	.303	1.15	248.56	5.28	-.63	239.46	7.34	[illegible]	[illegible]	[illegible]
7.000	.233	.152	1.08	241.55	6.11	-.55	233.51	6.54	-.21	839.	123[illegible].
8.000	.131	.069	.53	234.45	5.42	-.36	228.60	5.63	-.82	551.	1233
9.000	.082	.040	.16	227.58	4.24	.02	224.40	5.74	-1.44	49.	1233
10.000	99.999	99.999	999.99	221.69	3.50	.31	999.99	99.99	999.99	2.	123[illegible]
11.000	99.999	99.999	999.99	217.64	4.62	.56	999.99	99.99	999.99	0.	1223
12.000	99.999	99.999	999.99	215.84	6.06	.09	999.99	99.99	999.99	0.	12[illegible]
13.000	99.999	99.999	999.99	215.45	5.77	-.42	999.99	99.99	999.99	0.	1223
14.000	99.999	99.999	999.99	214.81	4.52	-.13	999.99	99.99	999.99	0.	1217
15.000	99.999	99.999	999.99	213.54	4.19	.05	999.99	99.99	999.99	0.	[illegible]
16.000	99.999	99.999	999.99	212.42	4.23	.04	999.99	99.99	999.99	0.	[illegible]
17.000	99.999	99.999	999.99	211.83	4.08	-.05	999.99	99.99	999.99	0	1192
18.000	99.999	99.999	999.99	211.72	3.62	-.13	999.99	99.99	999.99	0.	1178
19.000	99.999	99.999	999.99	211.93	3.31	-.16	999.99	99.99	999.99	0.	1163.
20.000	99.999	99.999	999.99	212.37	3.06	-.07	999.99	99.99	999.99	0.	1143
21.000	99.999	99.999	999.99	212.84	3.15	-.19	999.99	99.99	999.99	0.	108[illegible]
22.000	99.999	99.999	999.99	213.40	3.27	-.17	999.99	99.99	999.99	0.	1066
23.000	99.999	99.999	999.99	213.87	3.30	-.21	999.99	99.99	999.99	0.	1056
24.000	99.999	99.999	999.99	214.51	3.34	-.16	999.99	99.99	999.99	0.	1025
25.000	99.999	99.999	999.99	215.00	3.59	-.17	999.99	99.99	999.99	0.	970.
26.000	99.999	99.999	999.99	215.52	3.75	.00	999.99	99.99	999.99	0.	893
27.000	99.999	99.999	999.99	216.20	3.93	.12	999.99	99.99	999.99	0.	7[illegible]
28.000	99.999	99.999	999.99	216.76	4.14	.28	999.99	99.99	999.99	0.	651.
29.000	99.999	99.999	999.99	217.53	4.28	.37	999.99	99.99	999.99	0.	50[illegible].
30.000	99.999	99.999	999.99	218.54	4.56	.49	999.99	99.99	999.99	0.	31[illegible].

TABLE III. 13 MOISTURE RELATED STATISTICAL PARAMETERS, ANNUAL
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z	VAPOR P MEAN	S.D. VP	SKEW VP	TV MEAN	TV S.D.	SKEW TV	DEWPT T MEAN	S.D. DPT	SKEW DPT	NOBS T+P	NOBS TV
KM	MB	MB		DEG K	DEG K		DEG K	DEG K			
.000	10.940	5.336	.86	293.55	15.27	.22	279.78	7.77	-.63	13967.	13967.
1.000	7.303	3.249	.96	287.15	12.47	.26	274.41	6.35	-.29	13967.	13967.
1.288	6.455	2.878	1.02	285.33	11.91	.25	272.72	6.19	-.20	14598.	14599.
2.000	4.552	2.172	1.01	281.94	10.42	.02	267.85	6.42	-.19	14187.	14598.
3.000	3.190	1.669	.97	274.80	9.61	-.06	262.93	7.02	-.38	13969.	14595.
4.000	2.107	1.309	1.03	267.92	8.58	-.19	257.14	8.14	-.37	13677.	14595.
5.000	1.276	.938	1.29	261.02	7.91	-.36	250.61	8.78	-.18	13311.	14595.
6.000	.675	.566	1.78	254.09	7.79	-.40	243.33	8.51	.04	12695.	14593.
7.000	.338	.292	2.39	247.01	7.91	-.35	236.48	7.60	.11	11665.	14582.
8.000	.187	.151	2.46	239.72	7.74	-.18	231.21	6.56	.12	8933.	14572.
9.000	.115	.086	2.33	232.41	7.23	.06	227.02	5.95	.04	4349.	14564.
10.000	.067	.045	1.50	225.71	6.36	.23	222.35	5.81	-.45	1045	14550.
11.000	.043	.021	2.15	220.54	5.62	.05	218.78	4.25	-1.47	25.	14518.
12.000	99.999	99.999	999.99	217.54	5.35	-.27	999.99	99.99	999.99	0.	14481.
13.000	99.999	99.999	999.99	216.19	4.75	-.36	999.99	99.99	999.99	0.	14446.
14.000	99.999	99.999	999.99	214.80	4.31	.03	999.99	99.99	999.99	0.	14400.
15.000	99.999	99.999	999.99	213.15	4.55	.04	999.99	99.99	999.99	0.	14343.
16.000	99.999	99.999	999.99	212.08	4.61	-.01	999.99	99.99	999.99	0.	[illegible]
17.000	99.999	99.999	999.99	211.99	4.05	-.04	999.99	99.99	999.99	0.	14190.
18.000	99.999	99.999	999.99	212.54	3.36	-.15	999.99	99.99	999.99	0.	14068.
19.000	99.999	99.999	999.99	213.51	2.98	-.40	999.99	99.99	999.99	0.	13954.
20.000	39.999	99.999	999.99	214.52	2.98	-.54	999.99	99.99	999.99	0.	13807.
21.000	99.999	99.999	999.99	215.61	3.17	-.59	999.99	99.99	999.99	0.	13335.
22.000	99.999	99.999	999.99	216.64	3.42	-.64	999.99	99.99	999.93	0.	13212.
23.000	99.999	99.999	999.99	217.73	3.68	-.61	999.99	99.99	999.99	0.	[illegible]
24.000	99.999	99.999	999.99	218.86	3.96	- 7	999.99	99.99	999.99	0.	[illegible]
25.000	99.999	99.999	999.99	220.05	4.25	-.55	999.99	99.99	999.99	0.	[illegible]
26.000	99.999	99.999	999.99	221.26	4.54	-.52	999.99	99.99	999.99	0.	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4.87	[illegible]	[illegible]	[illegible]	[illegible]	0.	[illegible]
28.000	99.999	99.999	999.99	223.83	5.13	-.50	999.99	99.99	999.99	0.	[illegible]
29.000	99.999	99.999	999.99	225.33	5.34	-.51	999.99	99.99	999.99	0.	[illegible]
30.000	99.999	99.999	999.99	227.05	5.45	-.56	999.99	99.99	999.99	0.	[illegible]

JANUARY

TABLE IV.1 HYDROSTATIC MODEL ATMOSPHERE,
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	GEO. HT. KM	P MB	D G/M3	TV DEG K
.000	.000	1026.3000	1292.0000	277.07
1.000	.999	906.4700	1157.0000	273.03
1.288	1.287	874.3400	1121.0000	271.76
2.000	1.998	799.4000	1029.0000	270.59
3.000	2.997	703.8200	924.1000	265.32
4.000	3.996	618.1200	827.9000	260.10
5.000	4.994	541.3400	742.0000	254.15
6.000	5.992	472.5600	664.9000	247.59
7.000	6.989	410.9800	595.2000	240.55
8.000	7.986	355.9500	531.3000	233.40
9.000	8.983	306.9300	472.4000	226.36
10.000	9.980	263.5300	416.8000	220.24
11.000	10.976	225.4700	363.2000	216.24
12.000	11.972	192.5700	311.7000	215.21
13.000	12.968	164.4700	265.3000	215.97
14.000	13.963	140.4900	226.9000	215.67
15.000	14.958	119.9500	194.9000	214.37
16.000	15.953	102.3100	167.3000	213.03
17.000	16.947	87.2130	143.0000	212.45
18.000	17.941	74.3300	121.9000	212.48
19.000	18.935	63.3500	103.7000	212.77
20.000	19.928	54.0290	88.2500	213.29
21.000	20.922	46.0920	75.0900	213.84
22.000	21.914	39.3400	63.9200	214.40
23.000	22.907	33.5920	54.4500	214.93
24.000	23.899	28.6990	46.3500	215.70
25.000	24.891	24.5340	39.4800	216.50
26.000	25.883	20.9850	33.6400	217.33
27.000	26.874	17.9630	28.6900	218.14
28.000	27.865	15.3800	24.4700	219.05
29.000	28.856	13.1890	20.8600	220.28
30.000	29.846	11.3176	17.7800	221.74

FEBRUARY

TABLE IV. 2 HYDROSTATIC MODEL ATMOSPHERE,
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	GEO. HT. KM	P MB	D G/M3	TV DEG K
.000	.000	1022.3000	1260.0000	283.05
1.000	.999	904.9900	1137.0000	277.29
1.289	1.287	873.3600	1104.0000	275.54
2.000	1.998	799.2400	1022.0000	272.46
3.000	2.997	704.1000	922.3000	265.96
4.000	3.996	618.4600	826.3000	260.13
5.000	4.994	541.6000	743.4000	253.81
6.000	5.992	472.6600	666.9000	246.63
7.000	6.989	410.8600	597.5000	239.54
8.000	7.986	355.5100	533.4000	232.26
9.000	8.983	306.4200	474.0000	225.21
10.000	9.980	262.9000	417.4000	219.40
11.000	10.976	224.8700	362.3000	216.24
12.000	11.972	192.1300	309.6000	216.21
13.000	12.968	164.2300	263.3000	217.29
14.000	13.963	140.4100	225.6000	216.82
15.000	14.958	119.9700	194.1000	215.37
16.000	15.953	102.4100	166.6000	214.11
17.000	16.947	87.3630	142.7000	213.31
18.000	7.941	74.4970	121.8000	213.06
19.000	18.935	63.5300	103.8000	213.31
20.000	13.928	54.1950	88.3000	213.82
21.000	20.922	46.2510	75.1800	214.3[illegible]
22.000	21.914	39.4890	64.0300	214.87
23.000	22.907	33.7320	54.5300	215.51
24.000	23.899	28.8310	46.4400	216.29
25.000	24.891	24.6580	39.5600	217.12
26.000	25.883	21.1030	33.7100	218.08
27.000	26.874	18.0750	[illegible]	219.1[illegible]
28.000	27.865	15.4940	24.5000	220.28
29.000	28.856	13.2920	20.9100	221.44
30.000	29.846	11.4144	17.8000	222.73

MARCH

TABLE IV. 3 HYDROSTATIC MODEL ATMOSPHERE,
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	GEO. HT. KM	P MB	D G/M3	TV DEG K
.000	.000	1016.4000	1229.0000	288.48
1.000	.999	901.6100	1117.0000	281.27
1.288	1.287	870.5300	1086.0000	279.21
2.000	1.998	797.3800	1012.0000	274.51
3.000	2.997	702.9900	916.8000	267.12
4.000	3.996	617.7300	825.9000	260.57
5.000	4.994	541.0600	741.9000	254.06
6.000	5.992	472.2400	665.8000	247.10
7.000	6.989	410.5500	596.6000	239.73
8.000	7.986	355.3700	532.8000	232.37
9.000	8.983	306.2300	473.5000	225.33
10.000	9.980	262.7900	416.3000	219.73
11.000	10.976	224.8400	361.4000	216.76
12.000	11.972	192.1700	309.0000	216.63
13.000	12.968	164.3000	263.0000	217.61
14.000	13.963	140.5200	225.3000	217.26
15.000	14.958	120.1200	193.6000	216.11
16.000	15.953	102.6000	166.2000	215.12
17.000	16.947	87.5980	142.2000	214.64
18.000	17.941	74.7720	121.5000	214.41
19.000	18.935	63.8240	103.7000	214.48
20.000	19.928	54.4910	88.3600	214.84
21.000	20.922	46.5400	75.2700	215.40
22.000	21.914	39.7680	64.1400	216.01
23.000	22.907	33.9990	54.6600	216.69
24.000	23.899	29.0830	46.6100	217.35
25.000	24.891	24.8910	39.7500	218.13
26.000	25.883	21.3180	33.9000	219.10
27.000	26.874	18.2730	28.9000	220.25
28.000	27.865	15.6760	24.6600	221.46
29.000	28.856	13.4600	21.0500	222.74
30.000	29.846	11.5706	17.9500	224.46

APRIL

TABLE IV. 4 HYDROSTATIC MODEL ATMOSPHERE,
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	GEO. HT. KM	P MB	D G/M3	TV DEG K
.000	.000	1012.9000	1205.0000	293.21
1.000	.999	900.1400	1099.0000	285.45
1.288	1.287	869.5600	1069.0000	283.34
2.000	1.998	797.4800	998.0000	278.36
3.000	2.997	704.2300	907.2000	270.43
4.000	3.996	619.7200	820.3000	263.20
5.000	4.994	543.4800	738.7000	256.30
6.000	5.992	474.9100	663.6000	[illegible]
7.000	6.989	413.3700	595.3000	241.83
8.000	7.986	358.2900	532.1000	234.57
9.000	8.983	309.1800	473.5000	227.4[illegible]
10.000	9.980	265.6800	417.7000	221.5[illegible]
11.000	10.976	227.5400	364.0000	217.77
12.000	11.972	194.5500	312.8000	216.64
13.000	12.968	166.3200	266.6000	217.30
14.000	13.963	142.2300	228.0000	217.23
15.000	14.958	121.5900	195.8000	216.39
16.000	15.953	103.8900	167.8000	215.64
17.000	16.947	88.7330	143.7000	215.13
18.000	17.941	75.7670	122.9000	214.83
19.000	18.935	64.6930	104.9000	214.67
20.000	19.928	55.2480	89.4200	215.24
21.000	20.922	47.2010	76.1900	215.82
22.000	21.914	40.3470	64.9000	216.57
23.000	22.907	34.5100	55.3000	217.40
24.000	23.899	29.5370	47.1300	218.32
25.000	24.891	25.2990	40.1900	219.[illegible]
26.000	25.883	21.6870	34.2700	220.46
27.000	26.874	18.6060	29.2400	221.[illegible]
28.000	27.865	15.9790	24.9500	223.10
29.000	28.856	13.7380	21.2900	224.74
30.000	29.846	11.8263	18.1700	226.69

MAY

TABLE IV. 5 HYDROSTATIC MODEL ATMOSPHERE.
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	GEO. HT. KM	P MB	D G/M3	TV DEG K
.000	.000	1010.4000	1182.0000	298.38
1.000	.999	899.8300	1077.0000	290.97
1.288	1.287	869.8300	1048.0000	289.02
2.000	1.998	799.1800	978.0000	284.66
3.000	2.997	707.6900	891.2000	276.62
4.000	3.996	624.4900	809.2000	268.84
5.000	4.994	549.1200	731.8000	261.41
6.000	5.992	481.1100	659.3000	254.22
7.000	6.989	419.9200	592.6000	246.88
8.000	7.986	365.0200	531.2000	239.35
9.000	8.983	315.9900	474.8000	231.76
10.000	9.980	272.1000	421.9000	224.68
11.000	10.976	233.4100	371.2000	219.04
12.000	11.972	199.6100	322.0000	215.98
13.000	12.968	170.5000	275.4000	215.70
14.000	13.963	145.6600	234.7000	216.17
15.000	14.958	124.4500	200.9000	215.82
16.000	15.953	106.2900	172.2000	215.09
17.000	16.947	90.7460	147.3000	214.60
18.000	17.941	77.4630	125.8000	214.55
19.000	18.935	66.1390	107.1000	215.08
20.000	19.928	56.5000	91.1600	215.86
21.000	20.922	48.3020	77.5500	216.99
22.000	21.914	41.3290	66.0100	218.13
23.000	22.907	35.3950	56.2100	219.38
24.000	23.899	30.3420	47.8800	220.77
25.000	24.891	26.0380	40.8200	222.19
26.000	25.883	22.3670	34.8400	223.66
27.000	26.874	19.2340	29.7500	225.26
28.000	27.865	16.5600	25.4200	226.95
29.000	28.856	14.2740	21.7400	228.71
30.000	29.846	12.3192	18.6100	230.55

JUNE

TABLE IV. 6 HYDROSTATIC MODEL ATMOSPHERE.
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	GEO. HT. KM	P MB	D G/M3	TV DEG K
.000	.000	1008.5000	1159.0000	303.73
1.000	.999	900.0000	1058.0000	296.37
1.289	1.287	870.5400	1030.0000	294.47
2.000	1.998	801.1100	961.2000	290.34
3.000	2.997	711.1000	877.7000	282.23
4.000	3.996	629.0600	799.0000	274.28
5.000	4.994	54.5400	724.6000	266.62
6.000	5.992	487.1300	654.2000	259.40
7.000	6.989	426.3800	588.7000	252.30
8.000	7.986	371.7700	529.0000	244.84
9.000	8.983	322.7700	474.3000	237.08
10.000	9.980	278.9300	423.6000	229.42
11.000	10.976	239.9600	375.2000	222.82
12.000	11.972	205.6500	328.2000	218.30
13.000	12.968	175.8600	283.1000	216.41
14.000	13.963	150.2300	243.0000	215.36
15.000	14.958	128.2300	208.8000	213.95
16.000	15.953	109.3500	179.0000	212.83
17.000	16.947	93.2090	152.8000	212.54
18.000	17.941	79.4670	129.8000	213.27
19.000	18.935	67.8110	110.0000	214.83
20.000	19.928	57.9340	93.2900	216.34
21.000	20.922	49.5510	79.2400	217.83
22.000	21.914	42.4290	67.3800	219.36
23.000	22.907	36.3720	57.3600	220.91
24.000	23.899	31.2150	48.8700	222.50
25.000	24.891	26.8200	41.6900	224.10
26.000	25.883	23.0700	35.6000	225.75
27.000	26.874	19.8680	30.4300	[illegible]
28.000	27.865	17.1290	26.0500	229.09
29.000	28.856	14.7850	22.3100	230.85
30.000	29.846	12.7774	19.1300	232.66

JULY

TABLE IV. 7 HYDROSTATIC MODEL ATMOSPHERE.
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	GEO. HT. KM	P MB	D G/M3	TV DEG K
.000	.000	1007.4000	1135.0000	309.67
1.000	.999	901.0000	1038.0000	302.28
1.288	1.287	872.0700	1012.0000	300.22
2.000	1.998	803.8300	945.3000	296.24
3.000	2.997	715.2200	865.0000	288.04
4.000	3.996	634.2200	790.3000	279.55
5.000	4.994	560.3500	719.9300	271.15
6.000	5.992	493.2800	651.7000	263.67
7.000	6.989	432.7500	586.8000	256.92
8.000	7.986	378.3000	527.5000	249.83
9.000	8.983	329.4200	473.4000	242.43
10.000	9.980	285.6300	423.5000	234.96
11.000	10.976	246.5500	377.1000	227.77
12.000	11.972	211.9000	333.3000	221.49
13.000	12.968	181.4100	292.0000	216.45
14.000	13.963	154.8000	254.1000	212.20
15.000	14.958	131.7200	219.6000	209.00
16.000	15.953	111.9100	187.5000	207.93
17.000	16.947	95.0880	158.4000	209.16
18.000	17.941	80.9110	133.3000	211.51
19.000	18.935	68.9810	112.2000	214.16
20.000	19.928	58.9170	94.9100	216.25
21.000	20.922	50.3990	80.4400	218.25
22.000	21.914	43.1690	68.3800	219.91
23.000	22.907	37.0220	58.2200	221.54
24.000	23.899	31.7870	49.6300	223.11
25.000	24.891	27.3220	42.3600	224.68
26.000	25.883	23.5100	36.2000	226.23
27.000	26.874	20.2530	30.9600	227.92
28.000	27.865	17.4660	26.5200	229.46
29.000	28.856	15.0780	22.7400	231.01
30.000	29.846	13.0314	19.5100	232.68

AUGUST

TABLE IV. 8 HYDROSTATIC MODEL ATMOSPHERE.
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	GEO. HT. KM	P MB	D G/M3	TV DEG K
.000	.000	1008.4000	1143.0000	308.03
1.000	.999	901.4200	1044.0000	300.74
1.288	1.287	872.3300	1018.0000	298.65
2.000	1.998	803.7400	949.7000	294.84
3.000	2.997	714.7400	868.6000	286.66
4.000	3.996	633.4400	792.8000	279.33
5.000	4.994	559.4000	721.0000	270.30
6.000	5.992	492.2800	651.8000	263.12
7.000	6.989	431.7600	586.5000	256.46
8.000	7.986	377.3500	527.2000	249.35
9.000	8.983	328.4900	473.1000	241.88
10.000	9.980	284.7200	423.3000	234.32
11.000	10.976	245.6800	376.7000	227.19
12.000	11.972	211.0800	332.5000	221.13
13.000	12.968	180.6900	290.7000	216.50
14.000	13.963	154.2100	252.7000	212.57
15.000	14.958	131.2700	219.2000	209.62
16.000	15.953	111.5800	186.4000	208.55
17.000	16.947	94.8430	157.7000	209.51
18.000	17.941	80.7150	132.9000	211.60
19.000	18.935	68.8170	111.9000	214.16
20.000	19.929	58.7750	94.7100	216.18
21.000	20.922	50.2720	80.3200	218.05
22.000	21.914	43.0530	68.3000	219.59
23.000	22.907	36.9120	58.1700	221.06
24.000	23.899	31.6800	49.6000	222.50
25.000	24.891	27.2190	42.3500	223.98
26.000	25.883	23.4100	36.1700	225.44
27.000	26.874	20.1500	30.9400	[illegible]
28.000	27.865	17.3690	26.5100	228.28
29.000	28.856	14.9830	22.7200	229.68
30.000	29.846	12.9374	19.5000	231.11

SEPTEMBER

TABLE IV. 9 HYDROSTATIC MODEL ATMOSPHERE.
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	GEO. HT. KM	P MB	D G/M3	TV DEG K
.000	.000	1011.6000	1170.0000	301.82
1.000	.999	902.2200	1066.0000	294.94
1.288	1.287	872.5400	1038.0000	292.96
2.000	1.998	802.6900	966.0000	289.48
3.000	2.997	712.2900	880.9000	281.68
4.000	3.996	630.0000	801.0000	273.99
5.000	4.994	555.3600	725.1000	266.83
6.000	5.992	487.9500	653.6000	260.09
7.000	6.989	427.2700	588.0000	253.14
8.000	7.986	372.7300	528.4000	245.75
9.000	8.983	323.7800	473.7000	238.12
10.000	9.980	280.0100	422.9000	230.65
11.000	10.976	241.0900	374.5000	224.26
12.000	11.972	206.8300	327.9000	219.72
13.000	12.968	176.9700	284.6000	216.62
14.000	13.963	151.1100	246.2000	213.77
15.000	14.958	128.7800	212.2000	211.41
16.000	15.953	109.6000	181.7000	210.15
17.000	16.947	93.2530	154.4000	210.40
18.000	17.941	79.3660	130.6000	211.49
19.000	18.935	67.6570	110.5000	213.23
20.000	19.928	57.7380	93.5900	214.92
21.000	20.922	49.3340	79.3900	216.48
22.000	21.914	42.2010	67.4600	217.92
23.000	22.907	36.1410	57.3600	219.49
24.000	23.899	30.9860	48.8400	221.03
25.000	24.891	26.5940	41.6500	222.44
26.000	25.883	22.8480	35.5600	223.84
27.000	26.874	19.6490	30.3900	225.21
28.000	27.865	16.9140	26.0300	226.38
29.000	28.856	14.5710	22.3000	227.61
30.000	29.845	12.5639	19.1300	228.79

OCTOBER

TABLE IV. 10 HYDROSTATIC MODEL ATMOSPHERE.
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	GEO. HT. KM	P MB	D G/M3	TV DEG K
.000	.000	1016.9000	1209.0000	293.36
1.000	.999	904.2300	1095.0000	287.75
1.288	1.287	873.7700	1064.0000	286.11
2.000	1.998	802.2900	986.4000	283.34
3.000	2.997	710.2000	895.1000	276.40
4.000	3.996	626.8300	809.0000	269.92
5.000	4.994	551.6100	729.1000	263.57
6.000	5.992	483.8800	656.2000	256.87
7.000	6.989	422.9700	590.0000	249.75
8.000	7.986	368.2800	529.5000	242.28
9.000	8.983	319.2700	473.9000	234.70
10.000	9.980	275.5300	422.0000	227.44
11.000	10.976	236.7600	372.4000	221.45
12.000	11.972	202.7400	325.1000	217.22
13.000	12.968	173.1900	281.0000	214.68
14.000	13.963	147.7200	241.9000	212.72
15.000	14.958	125.8100	207.9000	210.79
16.000	15.953	107.0300	177.9000	209.65
17.000	16.947	91.0270	151.1000	209.86
18.000	17.941	77.4500	128.1000	210.66
19.000	18.935	65.9510	108.5000	211.60
20.000	19.928	56.2120	91.9200	213.04
21.000	20.922	47.9590	77.9500	214.34
22.000	21.914	40.9570	66.2100	215.49
23.000	22.907	35.0090	56.2800	216.70
24.000	23.899	29.9530	47.8500	217.92
25.000	24.891	25.6500	40.8000	219.02
26.000	25.883	21.9830	34.7800	220.19
27.000	26.874	18.8570	29.6800	[illegible]
28.000	27.865	16.1970	25.3700	222.27
29.000	28.856	13.9060	21.7000	223.29
30.000	29.846	11.9556	16.5700	224.30

NOVEMBER

TABLE IV. 11 HYDROSTATIC MODEL ATMOSPHERE.
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	GEO. HT. KM	P MB	D G/M3	TV DEG K
.000	.000	1021.2000	1245.0000	286.16
1.000	.999	905.2800	1124.0000	280.67
1.288	1.287	874.0200	1091.0000	279.01
2.000	1.998	800.7600	1010.0000	276.11
3.000	2.997	706.6900	911.0000	269.98
4.000	3.996	621.9700	819.9000	264.27
5.000	4.994	545.8600	736.4000	258.23
6.000	5.992	477.5500	661.0000	251.69
7.000	6.989	416.2800	592.6000	244.72
8.000	7.986	361.4400	530.0000	237.55
9.000	8.983	312.4800	472.5000	230.39
10.000	9.980	268.9800	418.5000	223.89
11.000	10.976	230.6500	367.1000	218.89
12.000	11.972	197.2400	318.2000	215.94
13.000	12.968	168.4000	273.5000	214.48
14.000	13.963	143.6400	234.7000	213.20
15.000	14.958	122.4100	201.4000	211.71
16.000	15.953	104.2200	172.3000	210.76
17.000	16.947	88.7000	146.7000	210.69
18.000	17.941	75.5030	124.7000	210.96
19.000	18.935	64.2930	106.0000	211.35
20.000	19.928	54.7620	90.0500	211.85
21.000	20.922	46.6690	76.5000	212.52
22.000	21.914	39.7980	64.9800	213.36
23.000	22.907	33.9620	55.2000	214.34
24.000	23.899	29.0050	46.9200	215.36
25.000	24.891	24.7900	39.9400	216.24
26.000	25.883	21.2020	34.0200	217.08
27.000	26.874	18.1460	28.9900	218.02
28.000	27.865	15.5400	24.7500	218.74
29.000	28.856	13.3160	21.1200	219.65
30.000	29.846	11.4194	18.0300	220.58

DECEMBER

TABLE IV. 12 HYDROSTATIC MODEL ATMOSPHERE.
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	GEO. HT. KM	P MB	D G/M3	TV DEG K
.000	.000	1025.2000	1284.0000	279.55
1.000	.999	906.1000	1151.0000	274.34
1.288	1.287	874.1300	1115.0000	273.04
2.000	1.998	739.5200	1025.0000	271.66
3.000	2.997	704.2900	920.9000	[illegible]
4.000	3.996	618.8700	825.4000	261.70
5.000	4.994	542.3100	740.2000	255.24
6.000	5.992	[illegible]	[illegible]	[illegible]
7.000	6.989	412.1700	594.4000	241.55
8.000	7.986	357.2000	530.8000	234.45
9.000	8.983	308.2400	471.8000	227.58
10.000	9.980	264.8900	416.3000	221.69
11.000	10.976	226.8700	363.1000	217.64
12.000	11.972	193.9100	313.0000	215.84
13.000	12.968	165.6100	267.6000	215.45
14.000	13.963	141.4000	229.3000	214.81
15.000	14.958	120.6500	196.8000	213.54
16.000	15.953	102.8500	168.7000	212.42
17.000	16.947	87.6330	144.1000	211.83
18.000	17.941	74.6490	122.8000	211.72
19.000	18.935	63.5940	104.5000	211.93
20.000	19.928	54.1930	88.8900	212.37
21.000	20.922	46.1900	75.6200	212.84
22.000	21.914	39.4010	64.3200	213.40
23.000	22.907	33.6190	54.7500	213.87
24.000	23.899	28.6980	46.6100	214.51
25.000	24.891	24.5090	39.7100	215.00
26.000	25.833	20.9400	33.8500	215.52
27.000	26.874	17.8990	28.8600	216.00
28.000	27.865	15.3070	24.6000	[illegible]
29.000	28.856	13.0980	20.9800	217.53
30.000	29.846	11.2160	17.9800	218.54

ANNUAL

TABLE IV. 13 HYDROSTATIC MODEL ATMOSPHERE,
STATION = 725720 DUGWAY (SALT LAKE CITY)

Z KM	GEO. HT. KM	P MB	D G/M3	TV DEG K
.000	.000	1015.6000	1209.0000	293.55
1.000	.999	902.8900	1095.0000	287.15
1.288	1.287	872.4100	1065.0000	285.33
2.000	1.998	800.7700	989.4000	281.94
3.000	2.997	708.4000	898.1000	274.80
4.000	3.996	624.7200	812.3000	267.92
5.000	4.994	549.1400	732.9000	261.02
6.000	5.992	481.0600	659.6000	254.09
7.000	6.989	419.8900	592.2000	247.01
8.000	7.986	365.0400	530.5000	239.72
9.000	8.983	316.0000	473.7000	232.41
10.000	9.980	272.3500	420.3000	225.71
11.000	10.976	233.8200	369.3000	222.54
12.000	11.972	200.1800	320.6000	217.54
13.000	12.968	171.1200	275.7000	216.19
14.000	13.963	146.1400	237.0000	214.80
15.000	14.958	124.6800	203.8000	213.15
16.000	15.953	106.2600	174.5000	212.08
17.000	16.947	90.5290	148.8000	211.99
18.000	17.941	77.1450	126.4000	212.54
19.000	18.935	65.7800	107.3000	213.31
20.000	19.928	56.1330	91.1600	214.52
21.000	20.922	47.9410	77.4600	215.61
22.000	21.914	40.9780	65.8900	216.64
23.000	22.907	35.0550	56.0900	217.73
24.000	23.899	30.0130	47.7700	218.86
25.000	24.891	25.7190	40.7100	220.06
26.000	25.883	22.0590	34.7300	221.26
27.000	26.874	18.9370	29.6400	[illegible]
28.000	27.865	16.2720	25.3200	223.83
29.000	28.856	13.9950	21.6400	225.33
30.000	29.846	12.0514	18.4900	227.05

APPENDIX A

EXAMPLES OF WINDS STATISTICS FOR DUGWAY, UTAH
(Data base is from Salt Lake City, Utah)

Appendix A gives some examples of further computations and graphical displays of wind statistics that can be derived from the statistical parameters presented in table I. These illustrations should aid the user of the RRA to understand the functional relationships of the probability wind models and, thus, to develop an appreciation of the powerful properties of the bivariate normal probability distribution function (PDF).

All illustrations for this appendix are derived from the five wind component statistical parameters from table I.1 for January and table I.7 for July for nine selected altitudes. These selected altitudes are 2, 4, 8, 12, 16, 20, 24, 28, and 30 km.

1. Windspeed (Tables A-1 and A-2)

The five wind components from table I are used as inputs to the generalized Rayleigh PDF, equation (29), and numerically integrated as indicated by equation (30) to obtain the PDF for windspeed. The PDF is then interpolated to obtain the percentile values for windspeed, as shown in tables A-1 and A-2.

2. Frequency of Wind Direction (Figures A-1 through A-18)

The derived frequencies for wind direction shown in figures A-1 through A-18 were obtained using the five wind component parameters from tables I.1 and I.7 as input values in equation (35). The limits of integration (performed numerically) are over the 22.5-degree interval for each of the 16 compass points. These graphs give the percentage frequency that the wind will blow from the direction intervals.

3. Mean Wind Components and 80th Interpercentile Range of Wind Components (Figures A-19 through A-36)

The wind component means with respect to any orthogonal axes are obtained by using the zonal and meridional mean wind components in equations (44) and (45). These component means form the circle shown in figures A-19 through A-36. Further, the zonal and meridional wind component variances and correlation coefficients are used in equations (46) and (47) to obtain the variances with respect to any orthogonal axes. These rotated component variances and the rotated component means are used in equation (8) to obtain the 80th interpercentile range of wind components and are then illustrated in figures A-19 through A-36.

4. Probability Ellipses (Figures A-37 through A-54)

Using the five wind component parameters from tables I.1 and I.7 and $p = 0.50$, $p = 0.95$, and $p = 0.99$ as input values to equation (13), the wind

probability ellipses shown in figures A-37 through A-54 were obtained by computer graphics. The statistical inferences are, for example, that 50 percent of the wind vectors lie within the smaller ellipse and 99 percent of the wind vectors lie within the outer ellipse. These probability ellipses are illustrated using the standard meteorological coordinate system explained in section I.B.1.

5. Conditional Windspeed Given the Wind Direction (Figures A-55 through A-72)

The five wind component parameters from table I.1 and table I.7 are used to evaluate the conditional PDF, equation (41). Interpolations of the conditional function are made to obtain the 5th, 15th, 50th (median), 85th, 95th, and 99th conditional percentile values of windspeed given the wind directions, are as shown in figures A-55 through A-72. The conditional mean windspeed, given the wind direction, is obtained from equation (40). The conditional mode (most probable) windspeed, given the wind direction, is obtained from equation (38). The conditional mean windspeed and the conditional windspeed modal value, given the wind direction, are also shown in these figures. For some figures, the conditional windspeed values are invalid for the given wind direction near 270° (from the west). This is caused by the lack of computational precision in evaluating equations (40) and (41) when the arguments for the Gaussian probability distribution have large negative values, i.e., when the coefficients (b/a) become less than -4 in these equations.

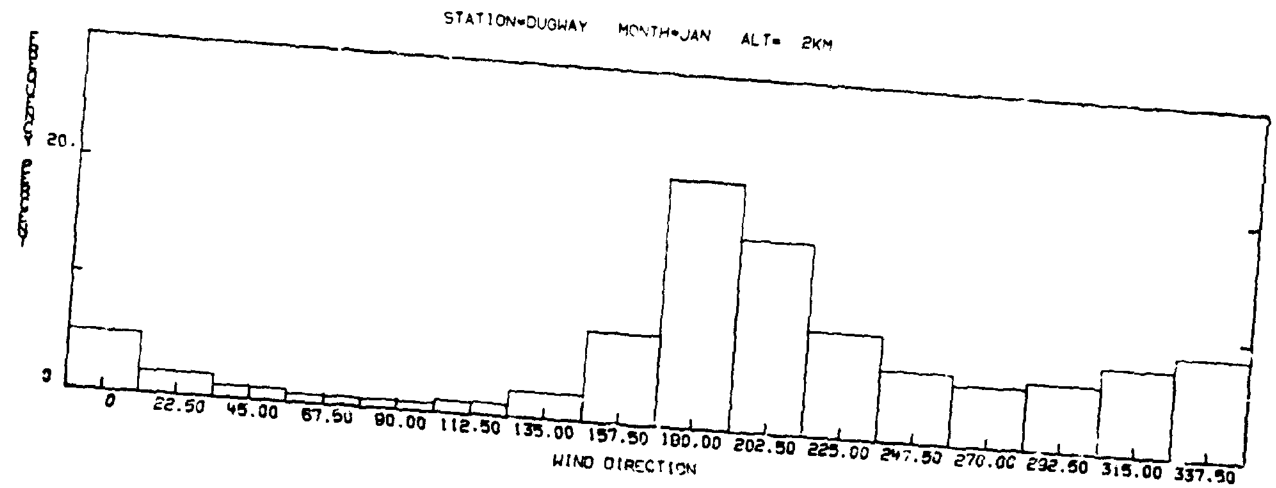
This appendix contains only a few of the many options in presenting wind statistics illustrations.

TABLE A-1. DERIVED (RAYLEIGH) PERCENTILES FOR WINDSPEED, JANUARY, DUGWAY, UTAH

	Altitude (km)								
	2	4	8	12	16	20	24	28	30
	R	R	R	R	R	R	R	R	R
%	M/S	M/S	M/S	M/S	M/S	M/S	M/S	M/S	M/S
1.0	.60	1.45	3.14	3.56	3.19	1.14	1.21	1.61	2.42
2.5	1.16	2.38	5.01	5.66	4.96	1.85	2.02	2.62	3.92
5.0	1.67	3.42	7.12	8.04	6.79	2.63	2.84	3.77	5.57
10.0	2.42	4.94	10.20	11.39	9.21	3.78	4.07	5.39	8.02
15.0	3.03	6.12	12.65	14.02	10.97	4.67	5.03	6.69	9.98
20.0	3.51	7.16	14.81	16.27	12.40	5.45	5.85	7.83	11.70
30.0	4.42	9.01	18.68	20.22	14.81	6.83	7.33	9.88	14.84
40.0	5.27	10.73	22.31	23.80	16.91	8.10	8.71	11.81	17.83
50.0	6.12	12.45	25.92	27.28	18.90	9.36	10.10	13.77	20.85
60.0	7.04	14.24	29.73	30.85	20.91	10.68	11.59	15.89	24.09
70.0	8.13	16.23	33.98	34.77	23.08	12.16	13.31	18.34	27.79
80.0	9.54	18.64	39.16	39.43	25.64	13.95	15.49	21.48	32.41
85.0	10.47	20.15	42.43	42.33	27.22	15.10	16.92	23.56	35.41
90.0	11.71	22.07	46.62	46.01	29.21	16.59	18.84	26.33	39.33
95.0	13.67	24.97	52.94	51.53	32.18	18.82	21.88	30.70	45.47
97.5	15.45	27.55	58.53	56.34	34.77	20.81	24.68	34.69	51.05
99.0	17.59	30.55	65.08	61.97	37.78	23.14	28.01	39.49	57.82

TABLE A-2. DERIVED (RAYLEIGH) PERCENTILES FOR WINDSPEED, JULY, DUGWAY, UTAH

	Altitude (km)								
	2	4	8	12	16	20	24	28	30
	R	R	R	R	R	R	R	R	R
%	M/S	M/S	M/S	M/S	M/S	M/S	M/S	M/S	M/S
1.0	.72	.78	2.01	3.75	1.31	.49	4.35	7.05	8.27
2.5	1.27	1.32	3.15	5.86	2.16	1.07	5.19	8.01	9.31
5.0	1.88	1.99	4.43	8.11	3.09	1.46	5.93	8.78	10.23
10.0	2.70	2.82	6.24	11.11	4.35	2.14	6.68	9.72	11.26
15.0	3.38	3.48	7.61	13.31	5.34	2.59	7.24	10.35	12.00
20.0	3.99	4.09	8.77	15.13	6.19	3.02	7.66	10.89	12.52
30.0	5.09	5.13	10.76	18.21	7.65	3.67	8.37	11.70	13.43
40.0	6.18	6.10	12.54	20.91	8.97	4.28	9.00	12.42	14.22
50.0	7.31	7.05	14.26	23.49	10.25	4.85	9.55	13.09	14.94
60.0	8.53	8.03	16.00	26.10	11.56	5.44	10.12	13.75	15.67
70.0	9.91	9.13	17.91	28.93	12.99	6.05	10.73	14.47	16.46
80.0	11.6	10.46	20.18	32.28	14.71	6.81	11.45	15.30	17.37
85.0	12.67	11.29	21.60	34.36	15.78	7.28	11.86	15.81	17.90
90.0	13.98	12.35	23.39	36.97	17.13	7.85	12.45	16.47	18.64
95.0	15.98	13.93	26.04	40.89	19.16	8.74	13.24	17.43	19.69
97.5	17.76	15.36	28.40	44.32	20.93	9.51	13.91	18.24	20.60
99.0	19.80	16.97	31.12	48.31	23.00	10.38	14.78	19.19	21.66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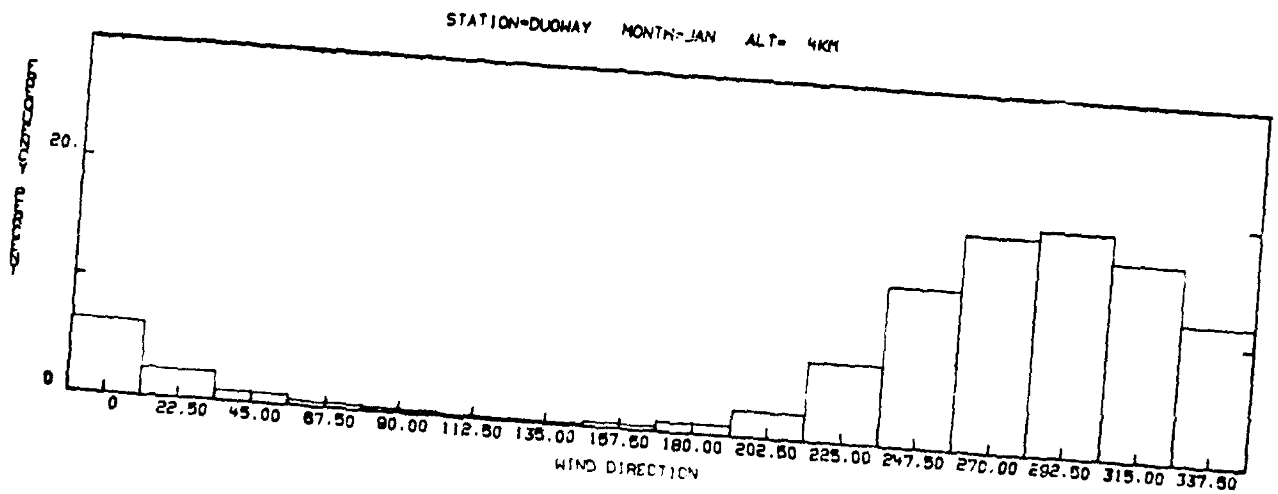
20.
0
0 22.50 45.00 67.50 90.00 112.50 135.00 157.50 180.00 202.50 225.00 247.50 270.00 292.50 315.00 337.50
WIND DIRECTION

Fig. A-1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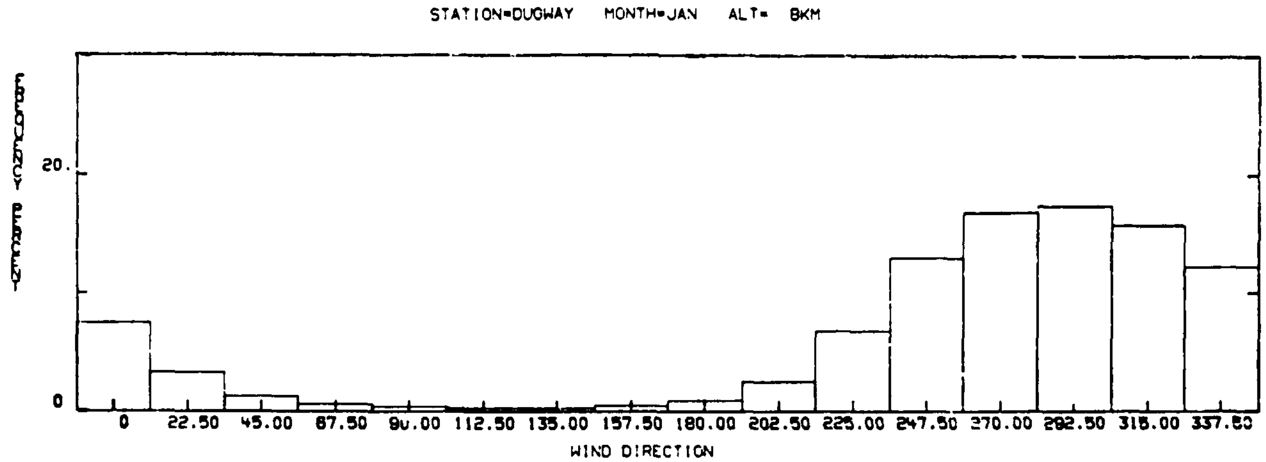
0 22.50 45.00 67.50 90.00 112.50 135.00 157.50 180.00 202.50 225.00 247.50 270.00 292.50 315.00 337.50
WIND DIRECTION

Fig. A-2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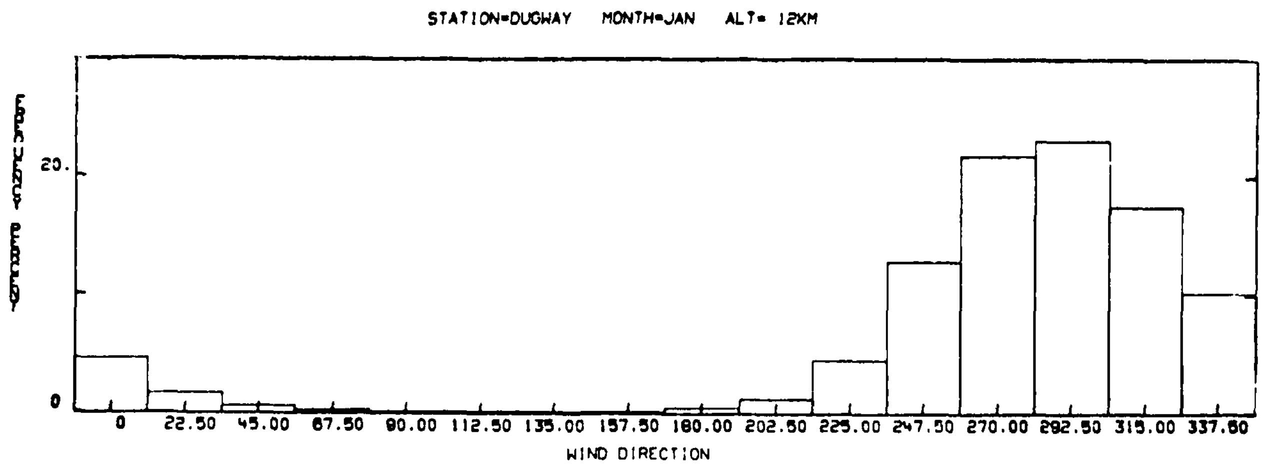
20.
0
0 22.50 45.00 67.50 90.00 112.50 135.00 157.50 180.00 202.50 225.00 247.50 270.00 292.50 315.00 337.50
WIND DIRECTION

Fig. A-3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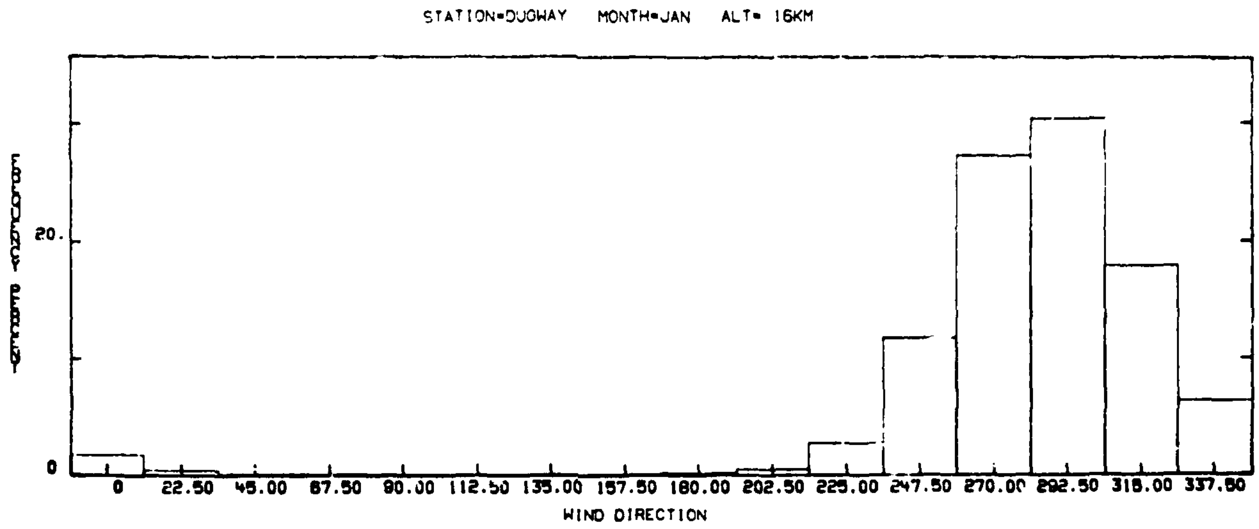
0
0 22.50 45.00 67.50 90.00 112.50 135.00 157.50 180.00 202.50 225.00 247.50 270.00 292.50 315.00 337.50
WIND DIRECTION

Fig. A-4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0
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45.00
67.50
90.00
112.50
135.00
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270.00
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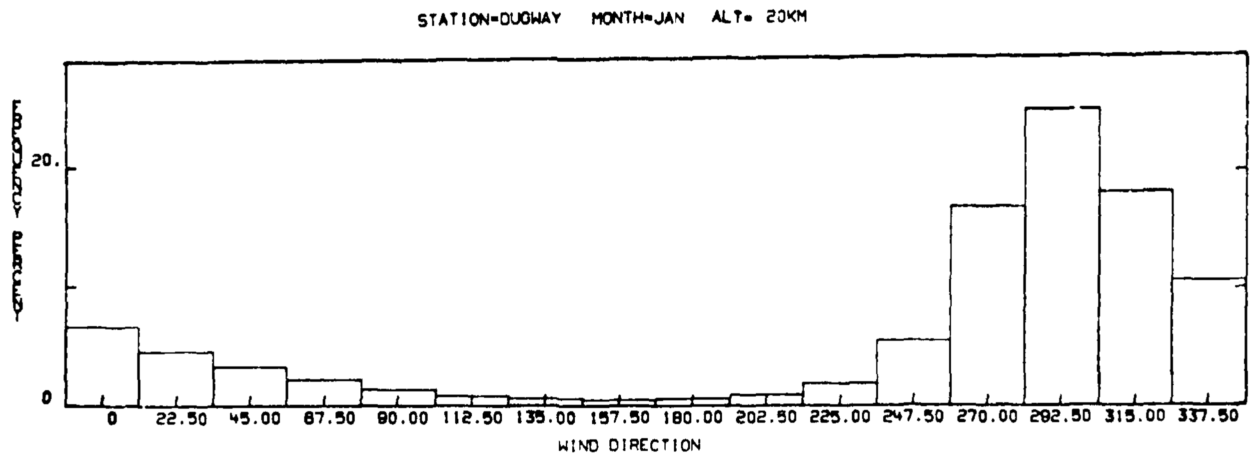
315.00
337.50
WIND DIRECTION

Fig. A-5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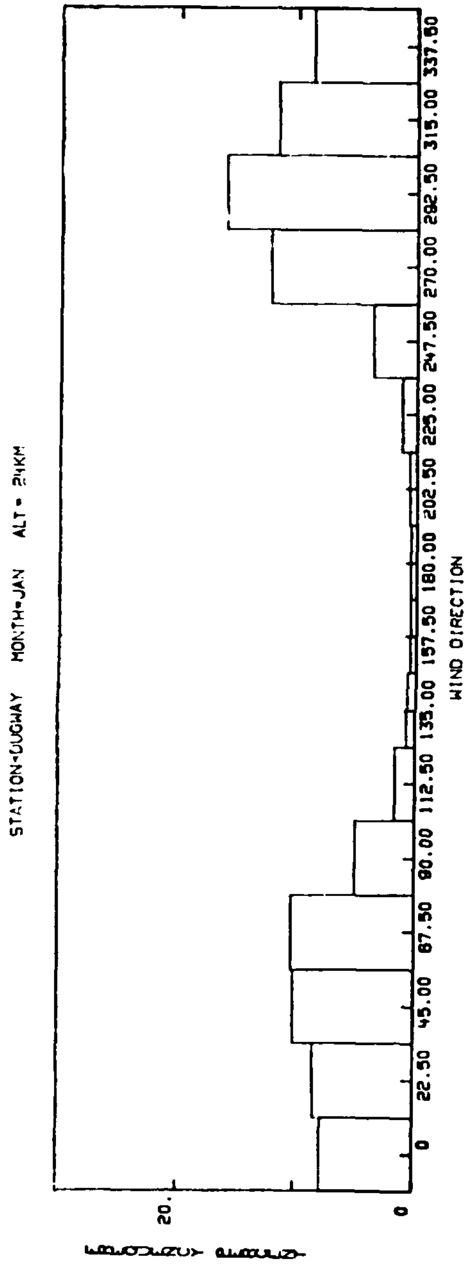
0
22.50
45.00
67.50
90.00
112.50
135.00
157.50
180.00
202.50
225.00
247.50
270.00
292.50
315.00
337.50
WIND DIRECTION

Fig. A-6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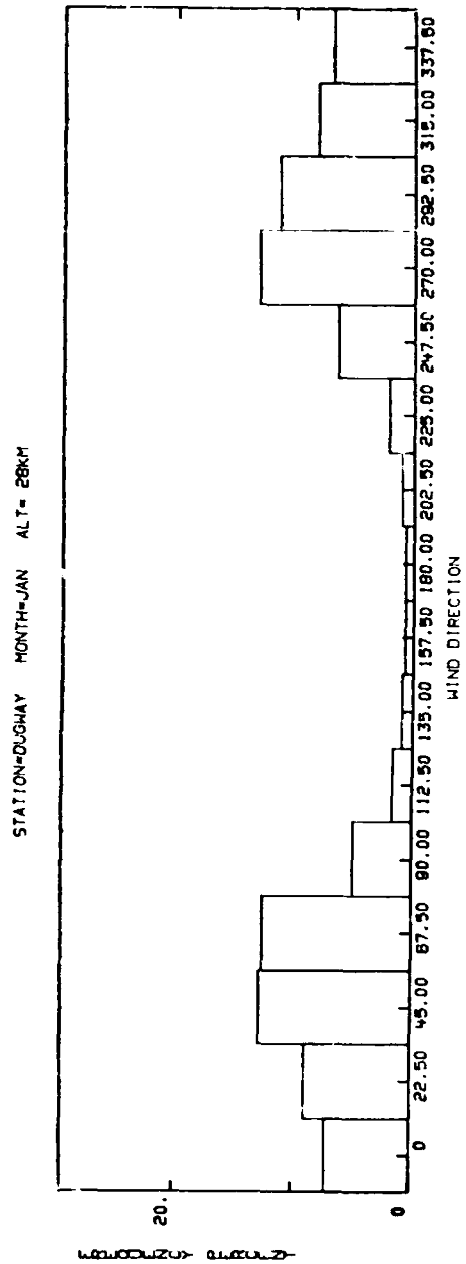
0
0 22.50 45.00 67.50 90.00 112.50 135.00 157.50 180.00 202.50 225.00 247.50 270.00 292.50 315.00 337.50
WIND DIRECTION

Fig. A-7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0
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WIND DIRECTION

Fig. A-8

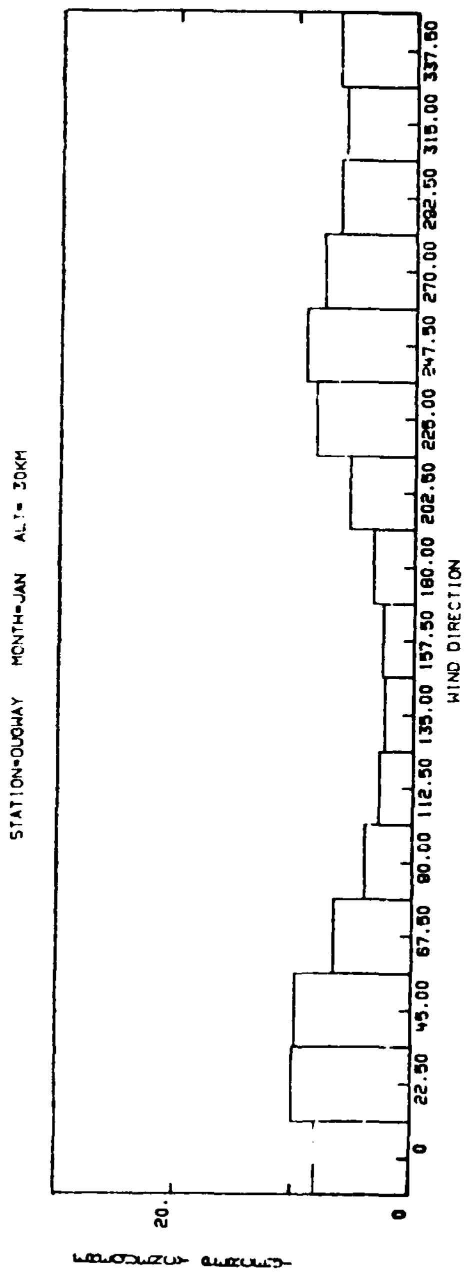


Fig. A-9

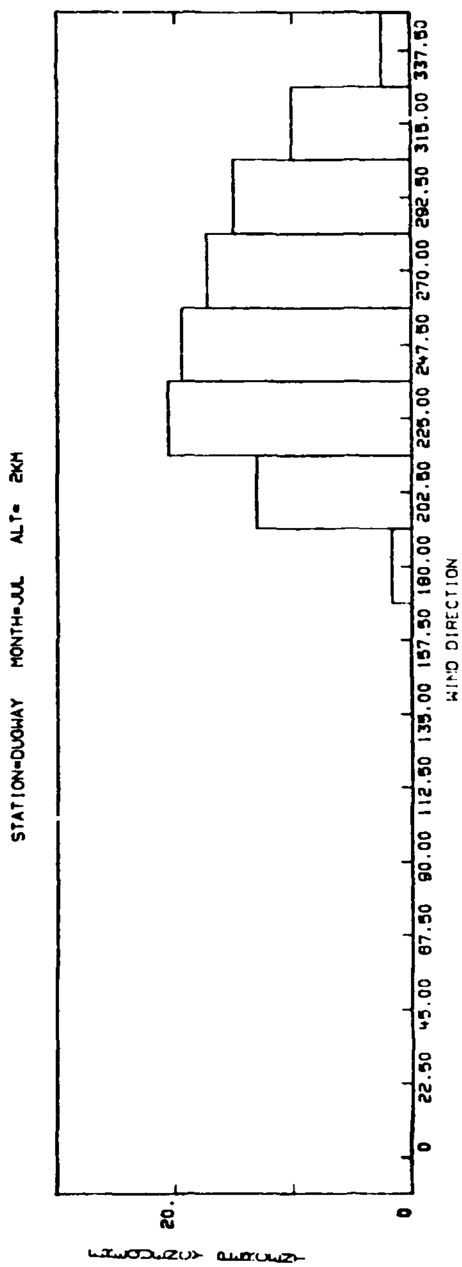


Fig. A-10

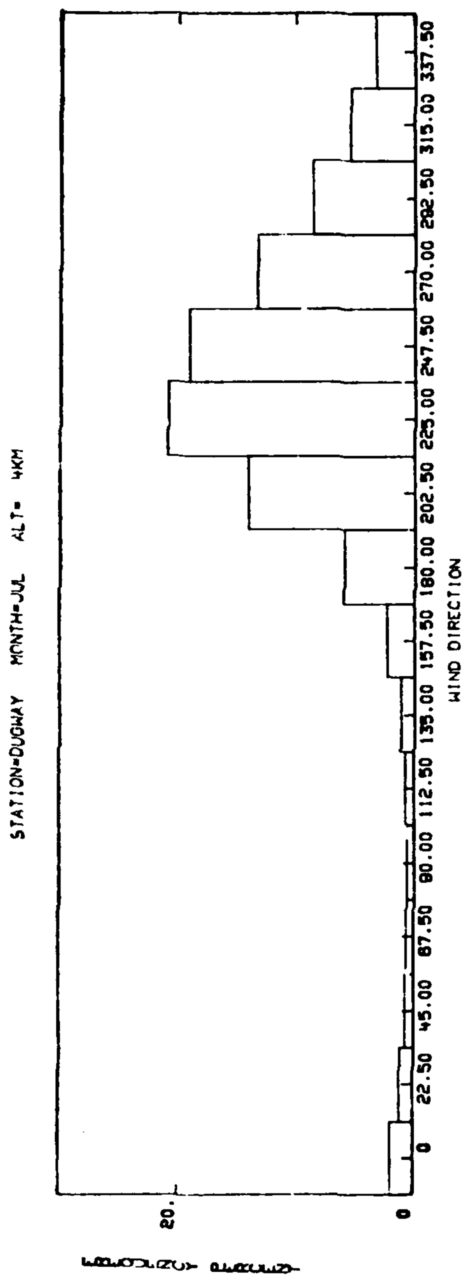


Fig. A-11

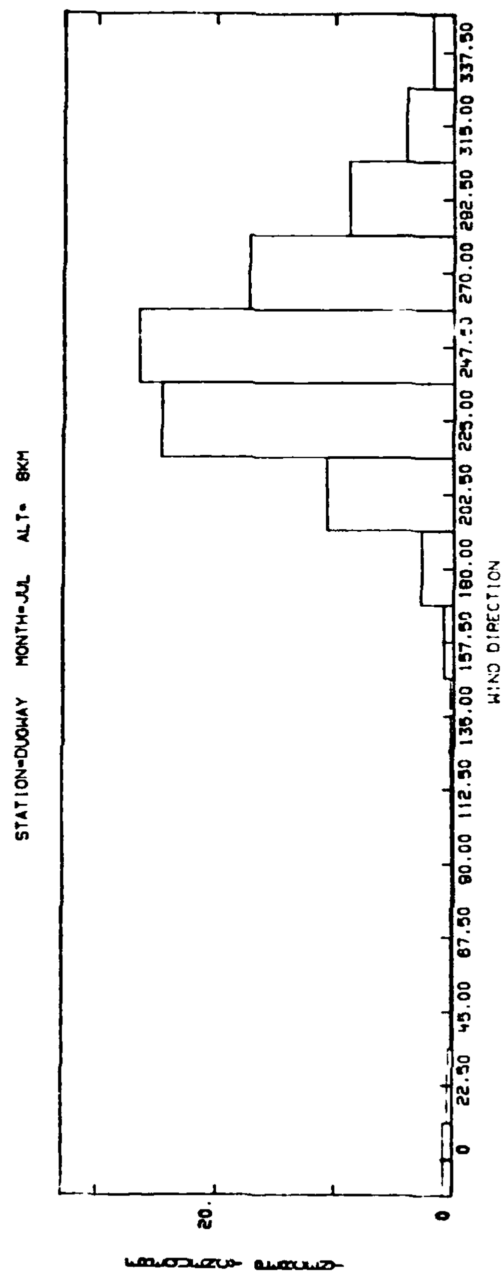


Fig. A-12

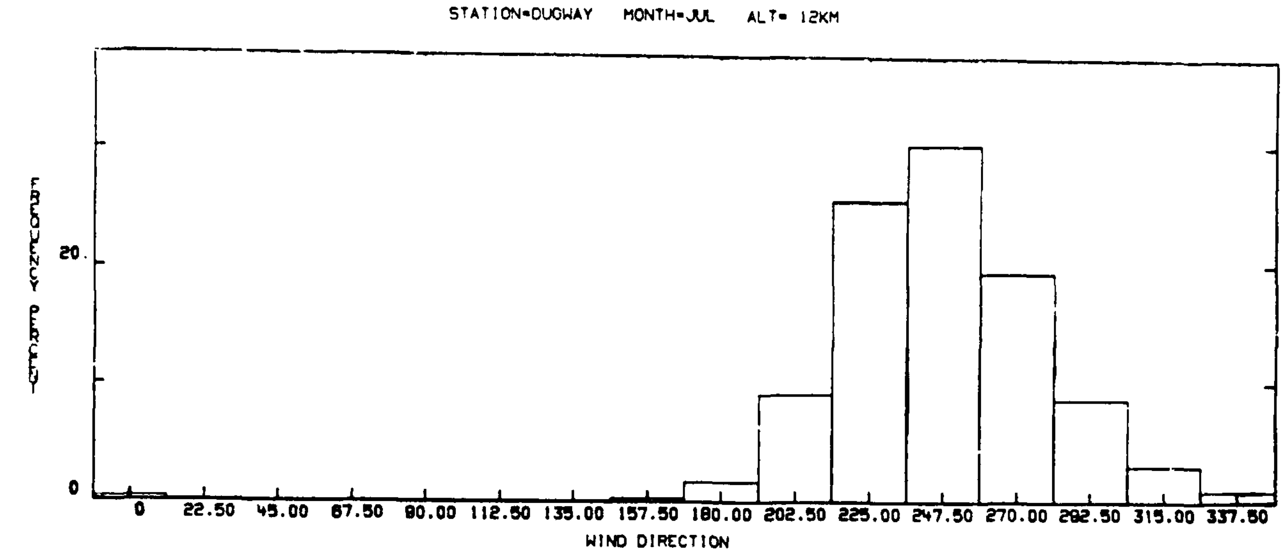


Fig. A-13

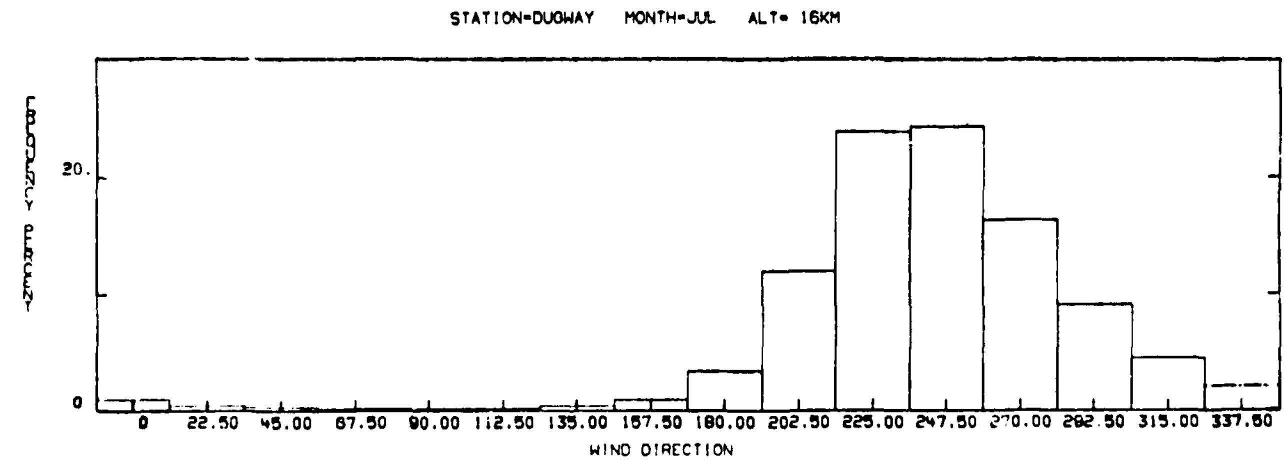


Fig. A-14

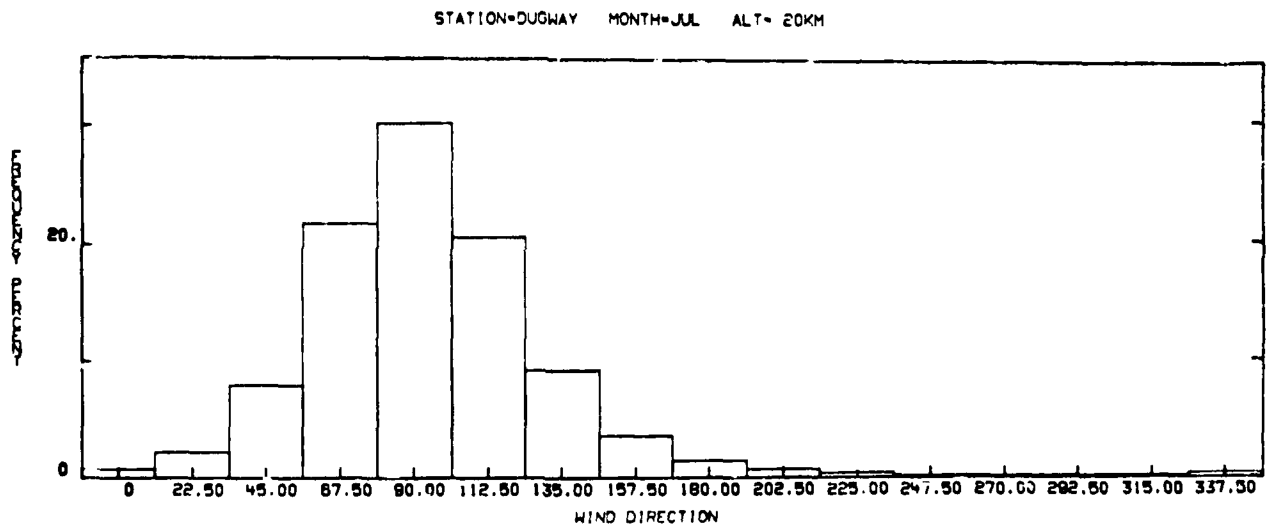

STATION=DUGWAY MONTH=JUL ALT= 20KM
FREQUENCY PERCENT
20.
0
0
22.50
45.00
67.50
90.00
112.50
135.00
157.50
180.00
202.50
225.00
247.50
270.00
292.50
315.00
337.50
WIND DIRECTION

Fig. A-15

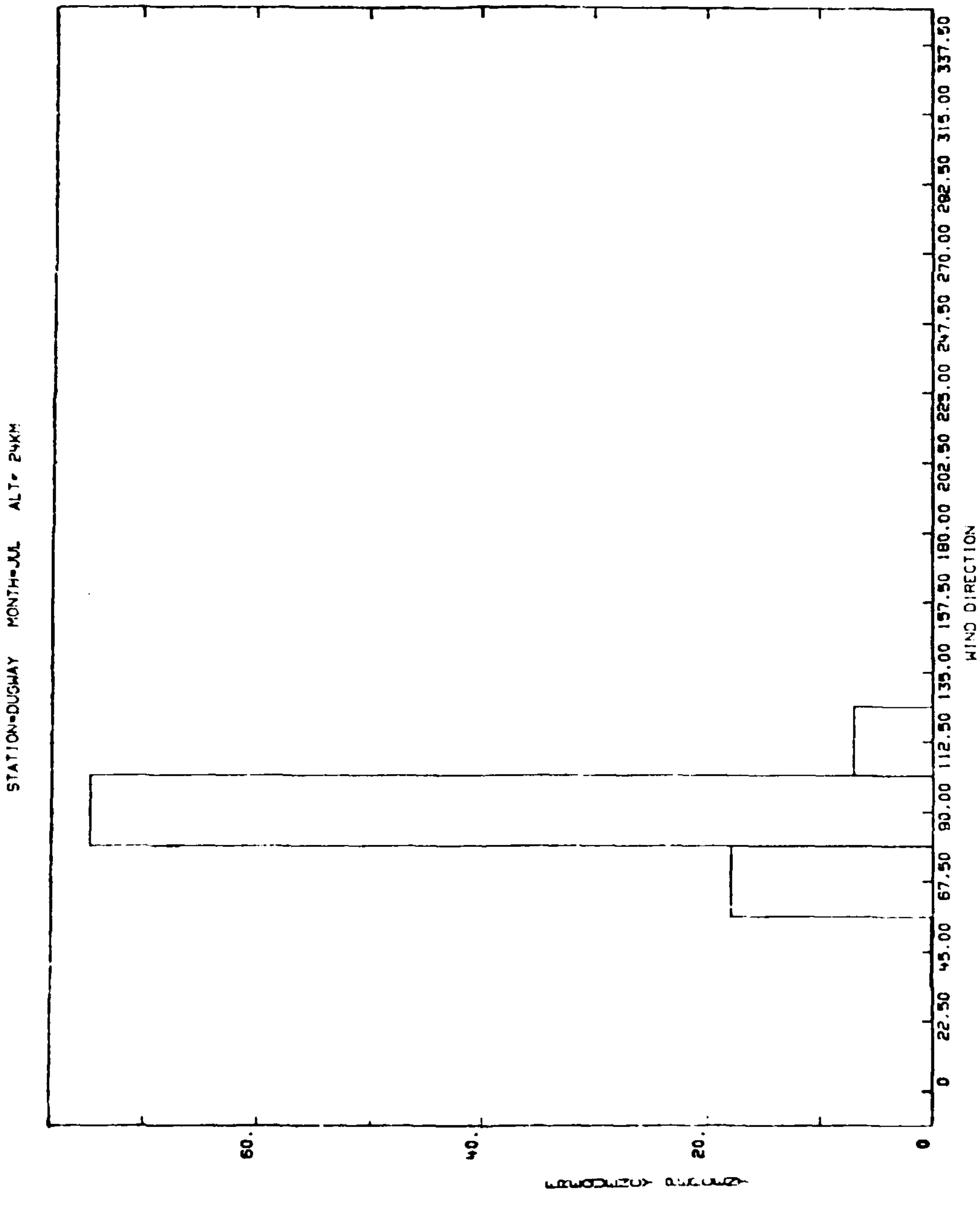

STATION=DUGWAY MONTH=JUL ALT= 24KM
0
20.
40.
60.
0
22.50
45.00
67.50
90.00
112.50
135.00
157.50
180.00
202.50
225.00
247.50
270.00
292.50
315.00
337.50
WIND DIRECTION

Fig. A-15

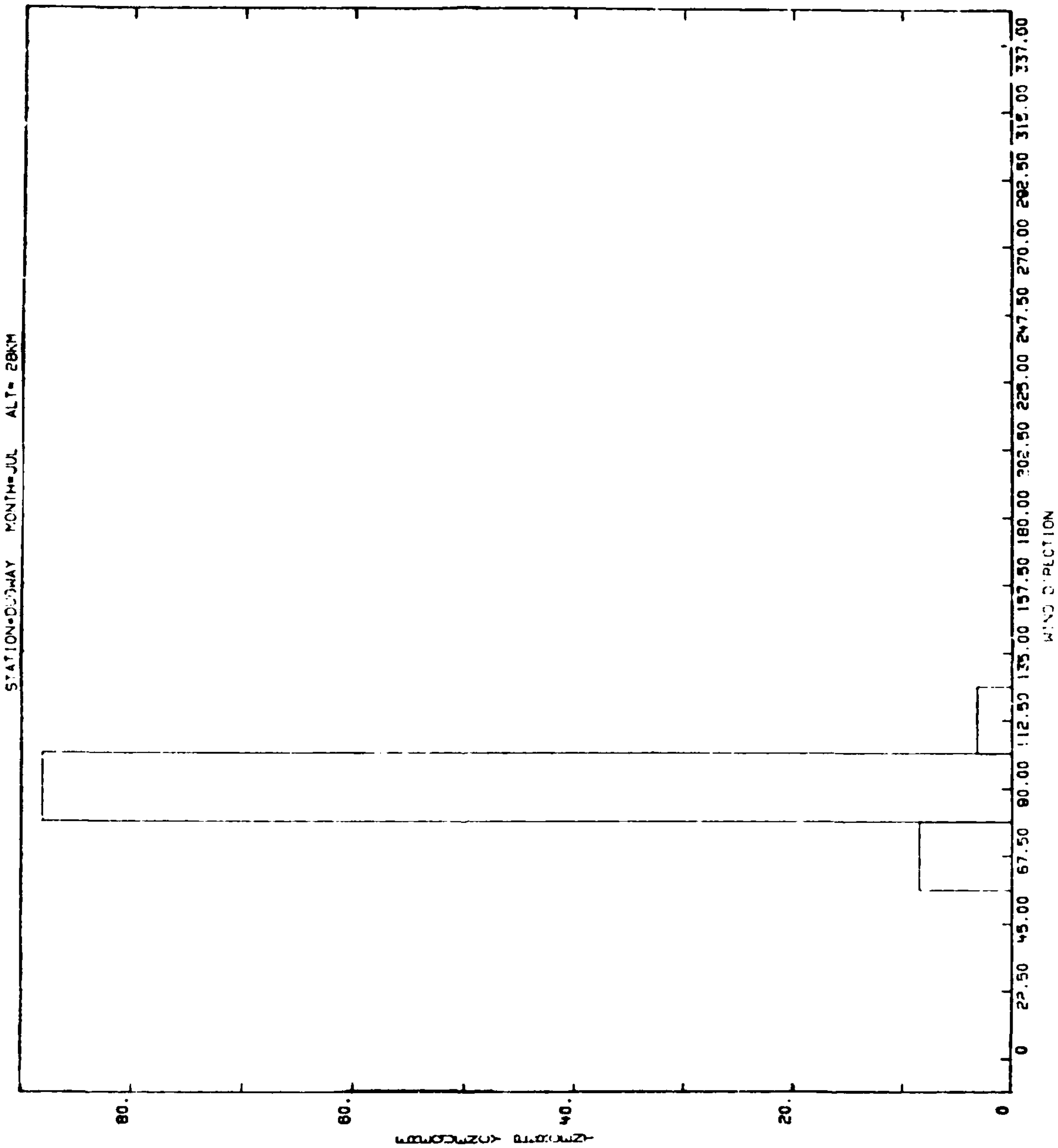

MONTH=JUL ALT= 28KM
0
22.50
45.00
67.50
90.00
112.50
135.00
157.50
180.00
202.50
225.00
247.50
270.00
292.50
315.00
337.50
0
20.
40.
60.
80.

Fig. A-17

STATION=DUGWAY   MONTH=JUL   ALT= 30KM

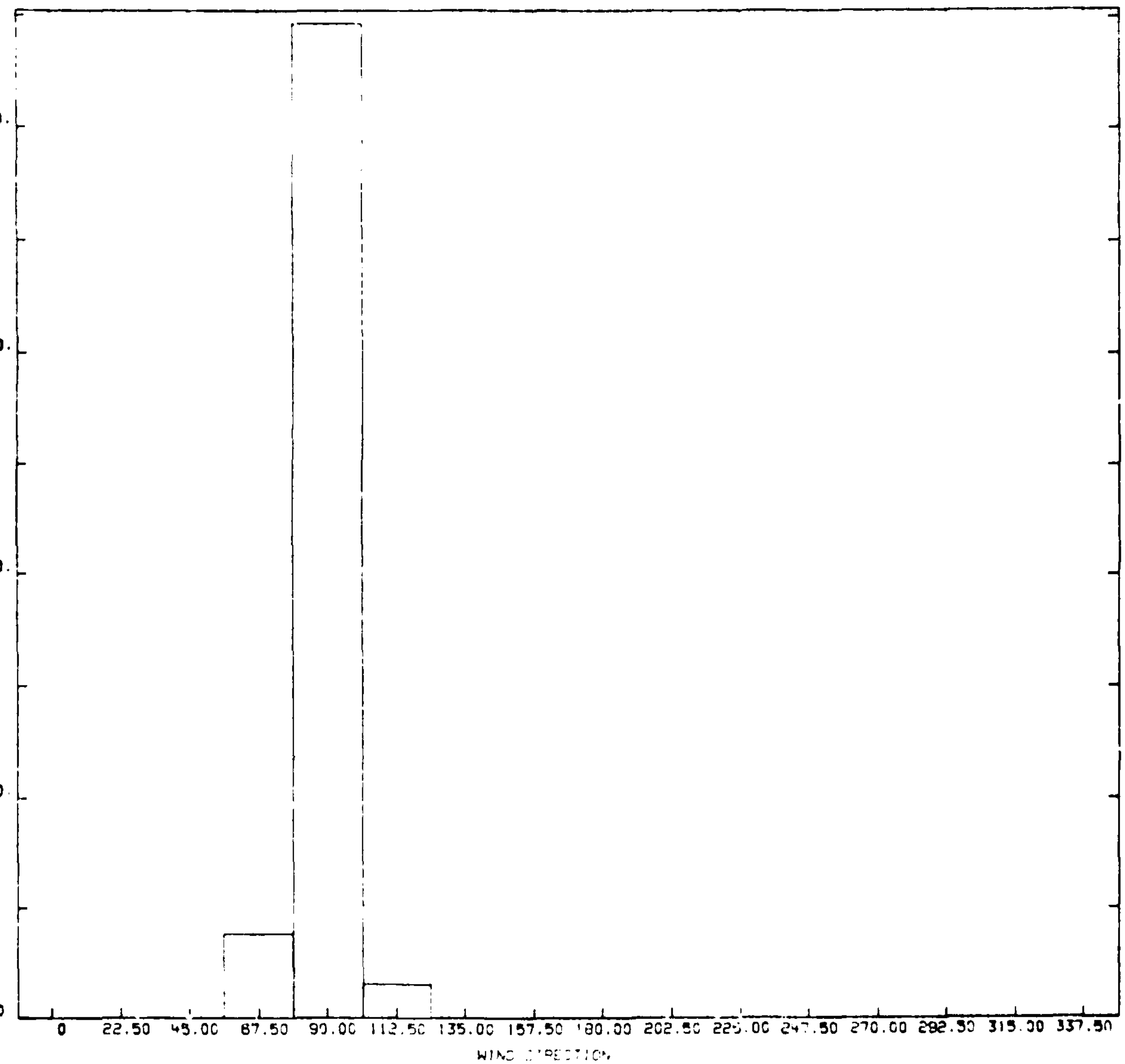


Fig. A-19

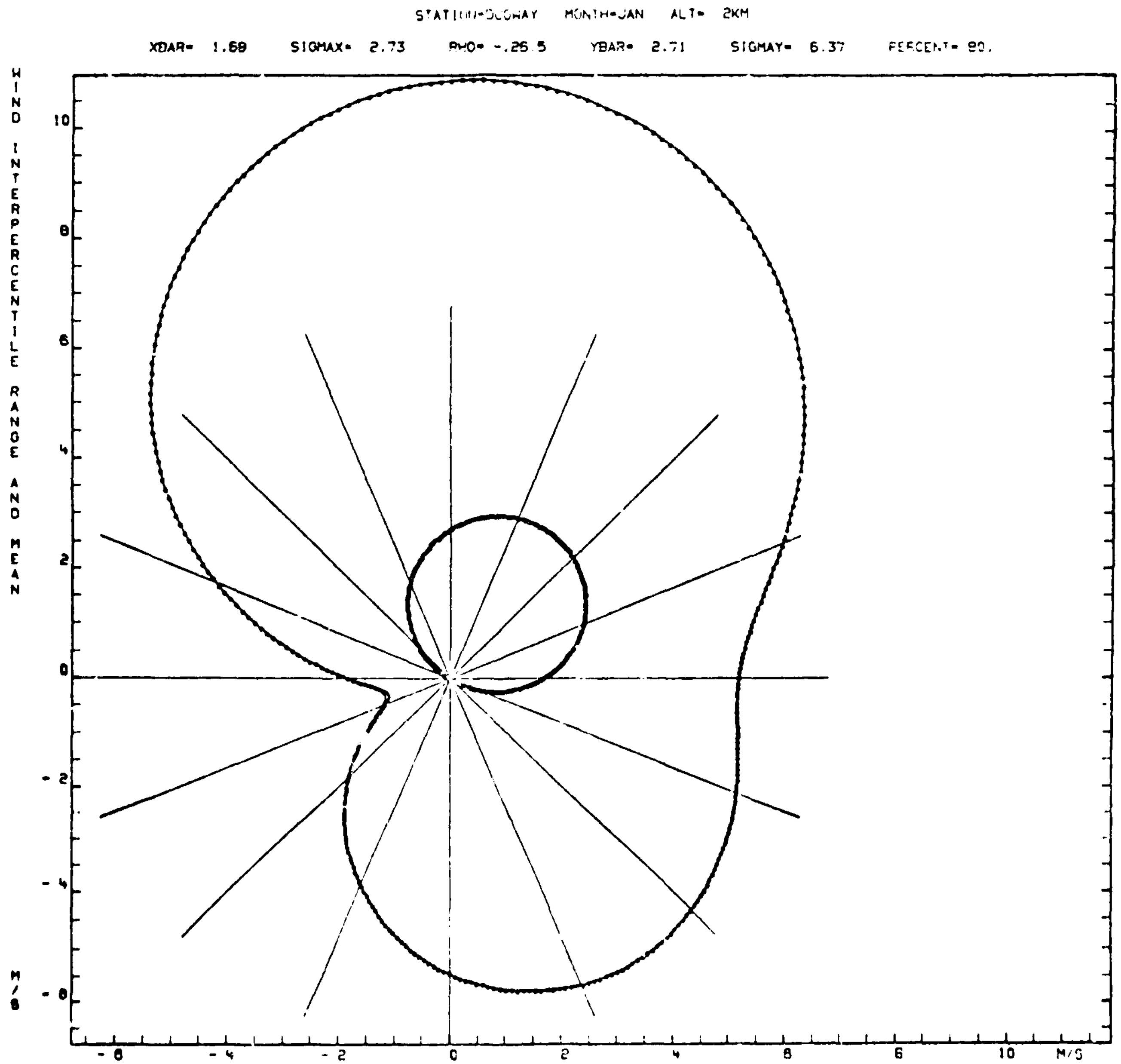

STATION=DUGWAY MONTH=JAN ALT= 2KM
XBAR= 1.68 SIGMAX= 2.73 RHO= -.265 YBAR= 2.71 SIGMAY= 6.37 PERCENT= 90.
WIND INTERPERCENTILE RANGE AND MEAN
M/S
10
8
6
4
2
0
-2
-4
-6
M/S

Fig. A-19

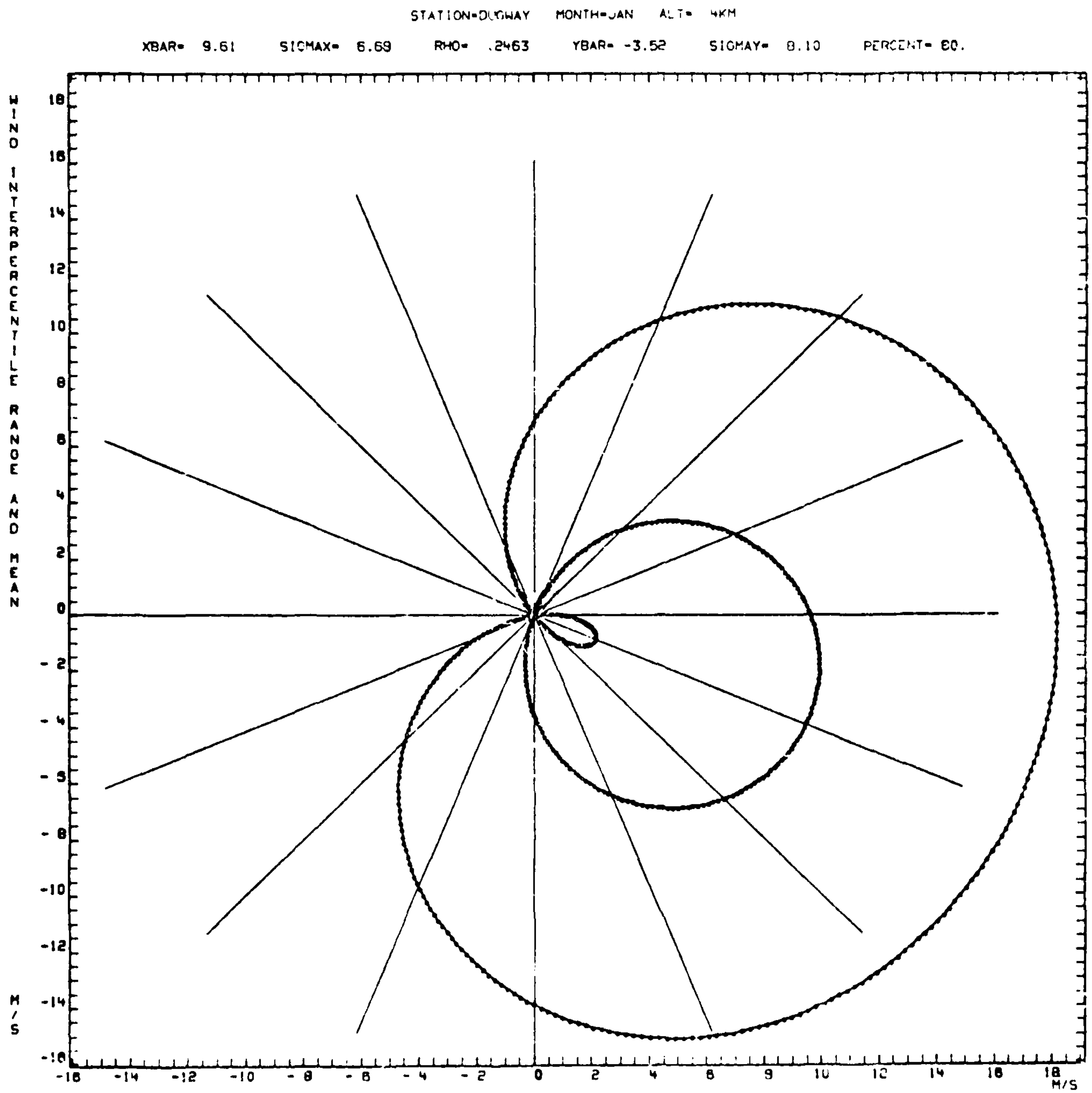

STATION=DUGWAY MONTH=JAN ALT= 4KM
XBAR= 9.61 SIGMAX= 6.69 RHO= .2463 YBAR= -3.52 SIGMAY= 8.10 PERCENT= 80.
WIND INTERPERCENTILE RANGE AND MEAN
M/S
M/S

Fig. A-20

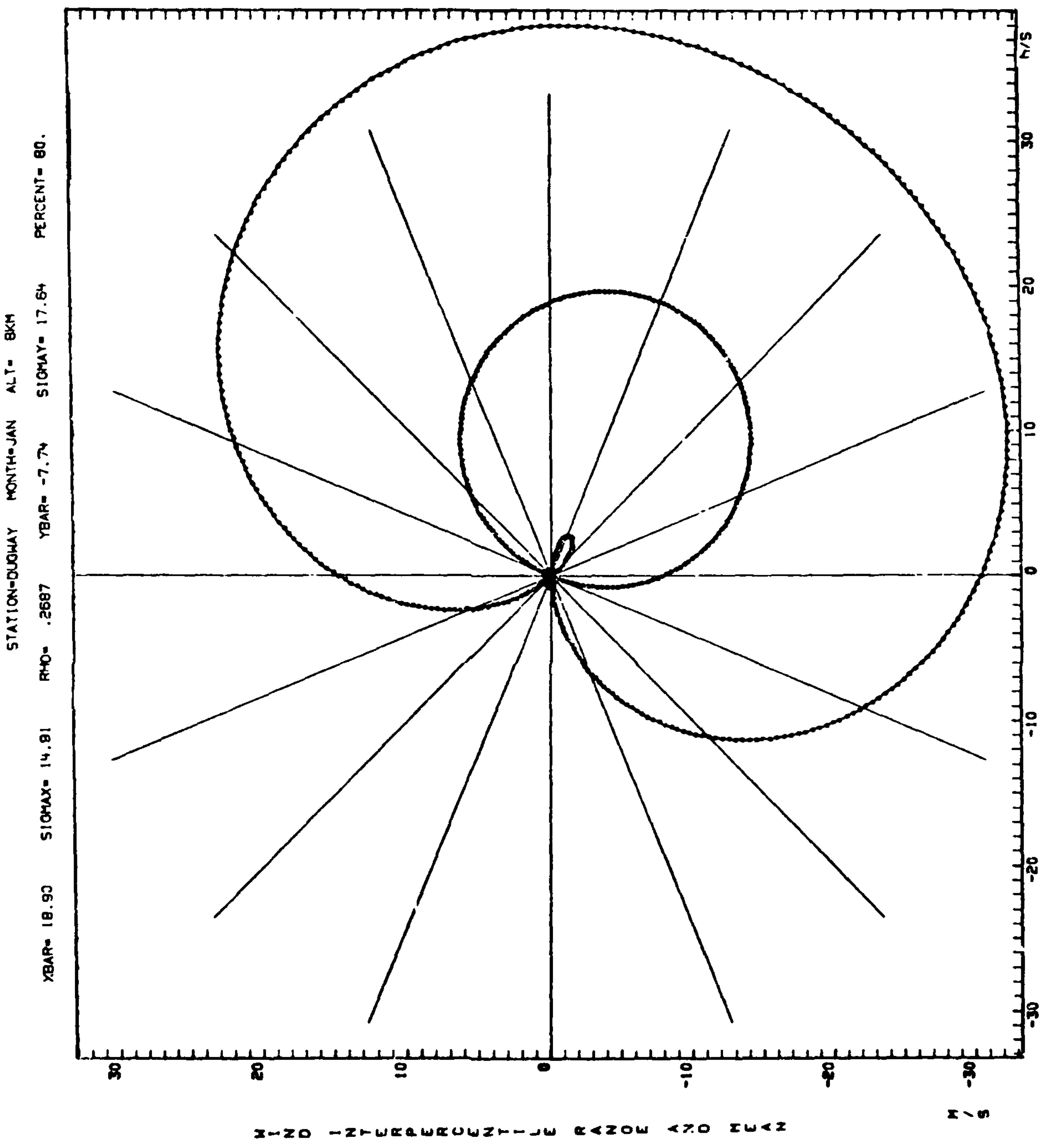

STATION=DUGWAY MONTH=JAN ALT= 8KM
XBAR= 18.93 SIGMAX= 14.81 RHO= .2687 YBAR= -7.74 SIGMAY= 17.64 PERCENT= 80.
M/S
M/S

Fig. A-21

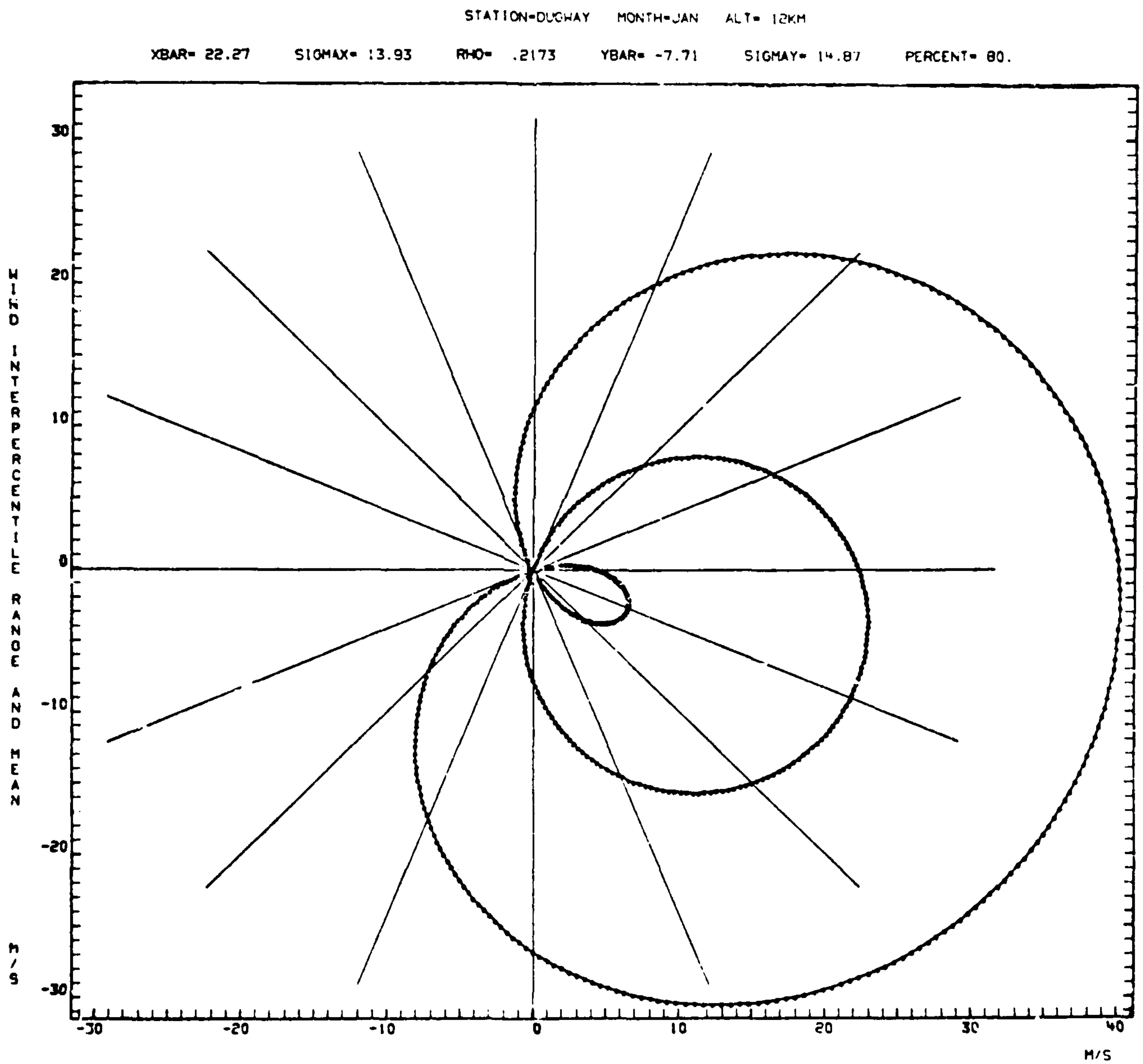

STATION=DUGWAY MONTH=JAN ALT= 12KM
XBAR= 22.27 SIGMAX= 13.93 RHO= .2173 YBAR= -7.71 SIGMAY= 14.87 PERCENT= 80.
WIND INTERPERCENTILE RANGE AND MEAN
M/S
M/S

Fig. A-22

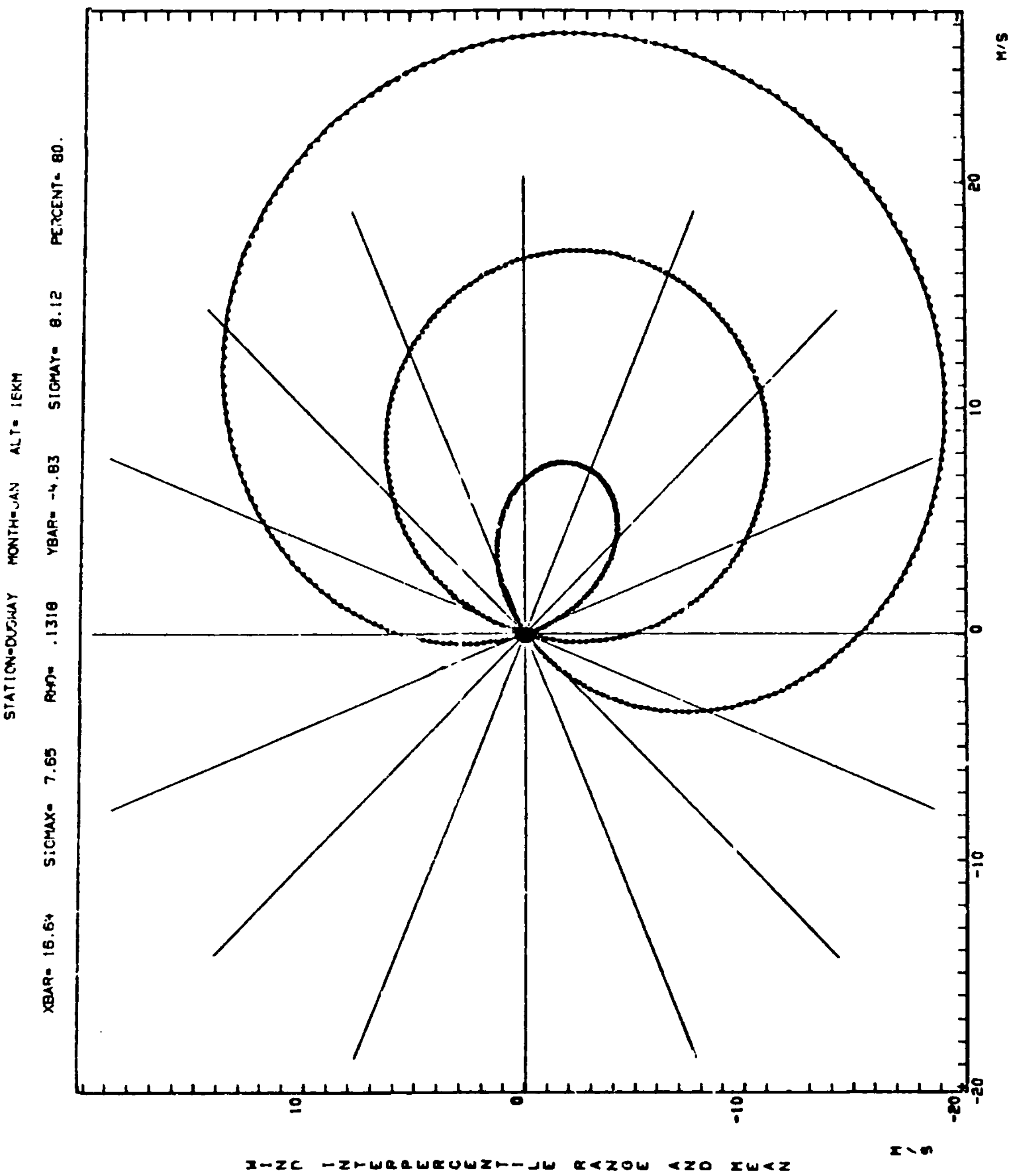

STATION=DUGWAY MONTH=JAN ALT= 16KM
XBAR= 16.64 SIGMAX= 7.65 RHO= .1318 YBAR= -4.83 SIGMAY= 8.12 PERCENT= 80.
M/S
10
0
-10
-20
20

Fig. A-23

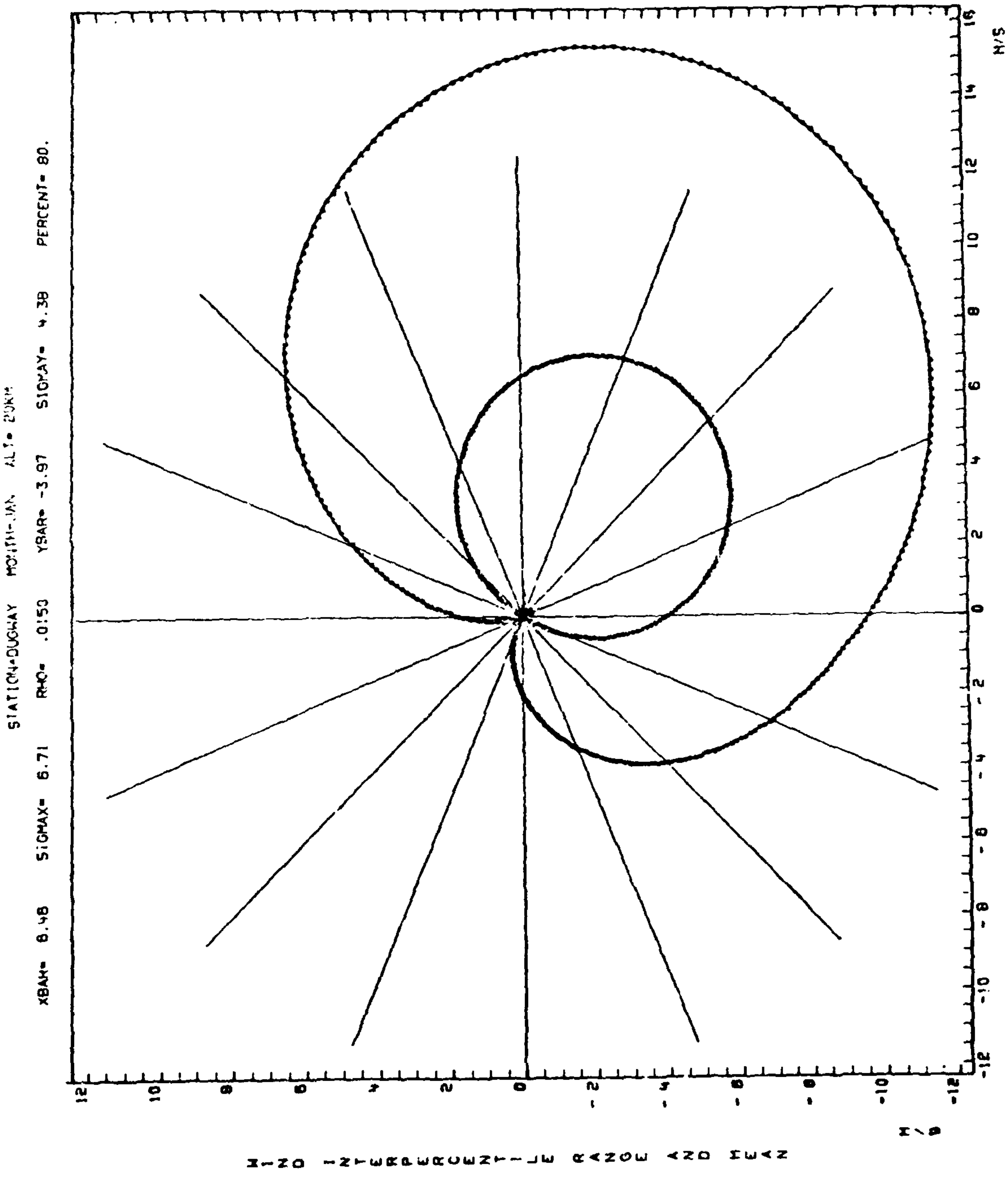

STATION=DUGWAY MONTH=JAN ALT= 20KM
XBAR= 8.48 SIGMAX= 6.71 RHO= .0153 YBAR= -3.97 SIGMAY= 4.38 PERCENT= 80.
M/S

Fig. A-24

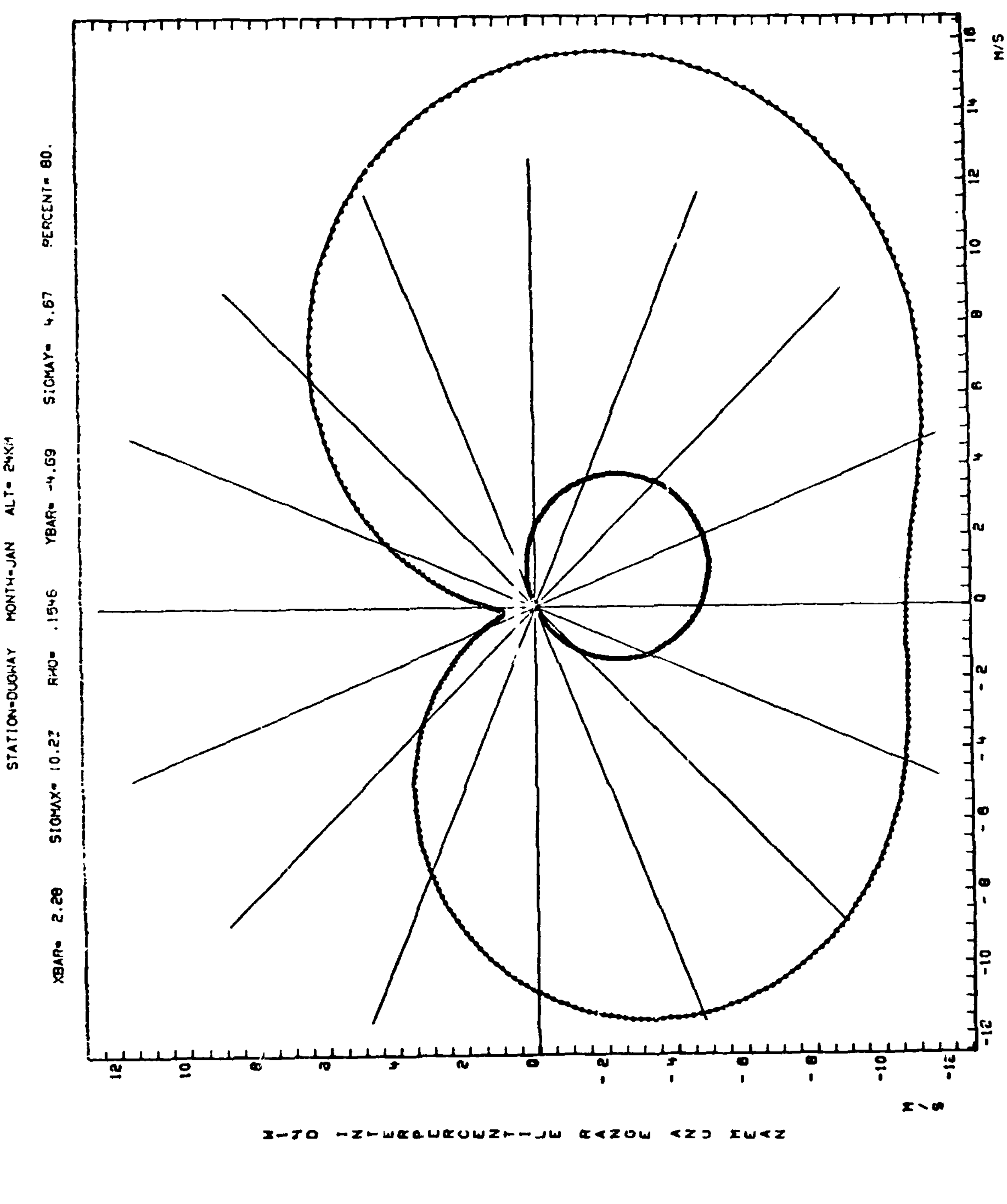

STATION=DUGWAY MONTH=JAN ALT= 24KM
XBAR= 2.28 SIGMAX= 10.27 RHO= .1546 YBAR= -4.69 SIGMAY= 4.67 PERCENT= 80.
M/S
M/S

Fig. A-25

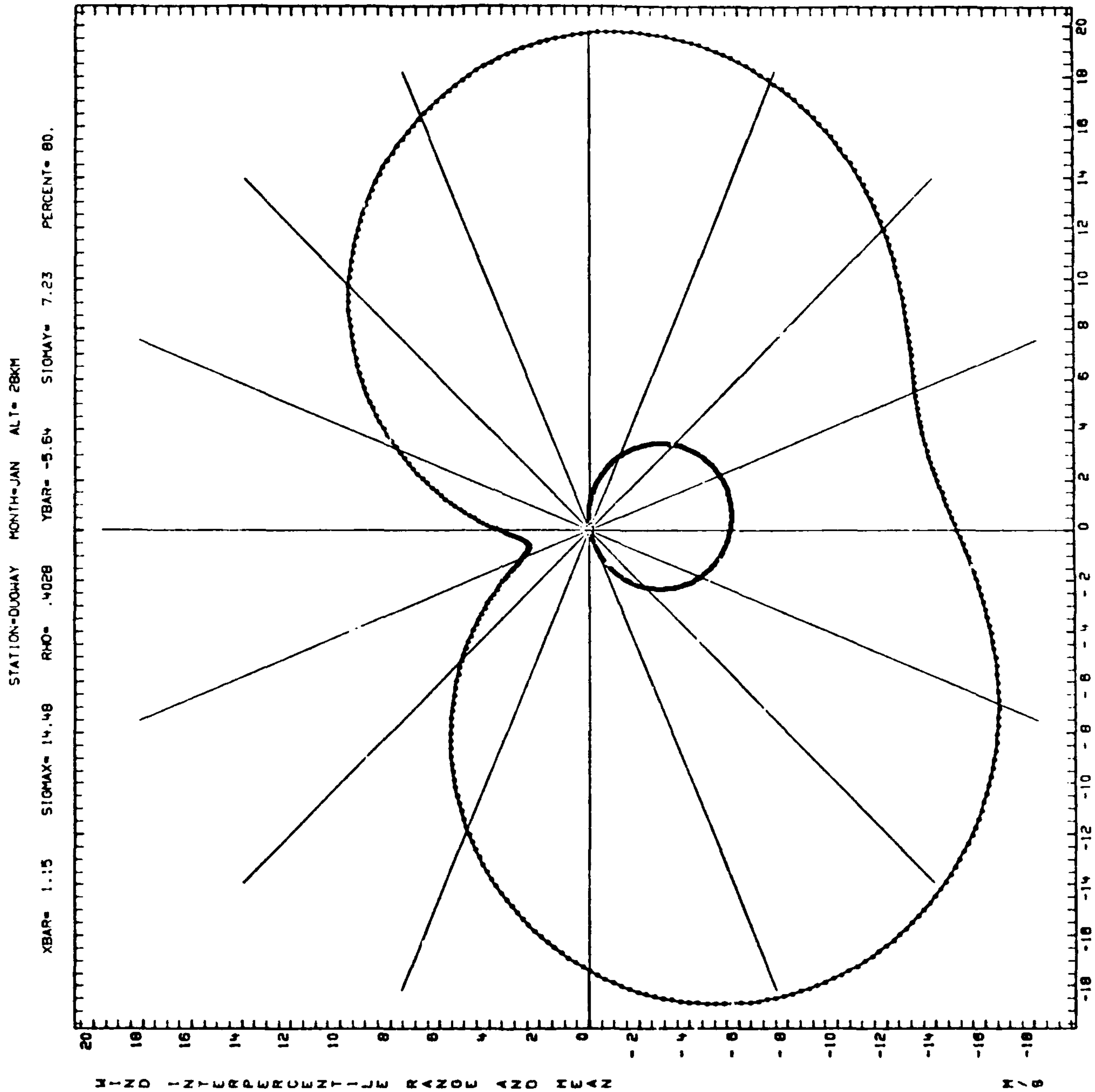

STATION=DUGWAY MONTH=JAN ALT= 28KM
XBAR= 1.15 SIGMAX= 14.48 RHO= .4028 YBAR= -5.64 SIGMAY= 7.23 PERCENT= 80.
M/S
M/S

Fig. A-26

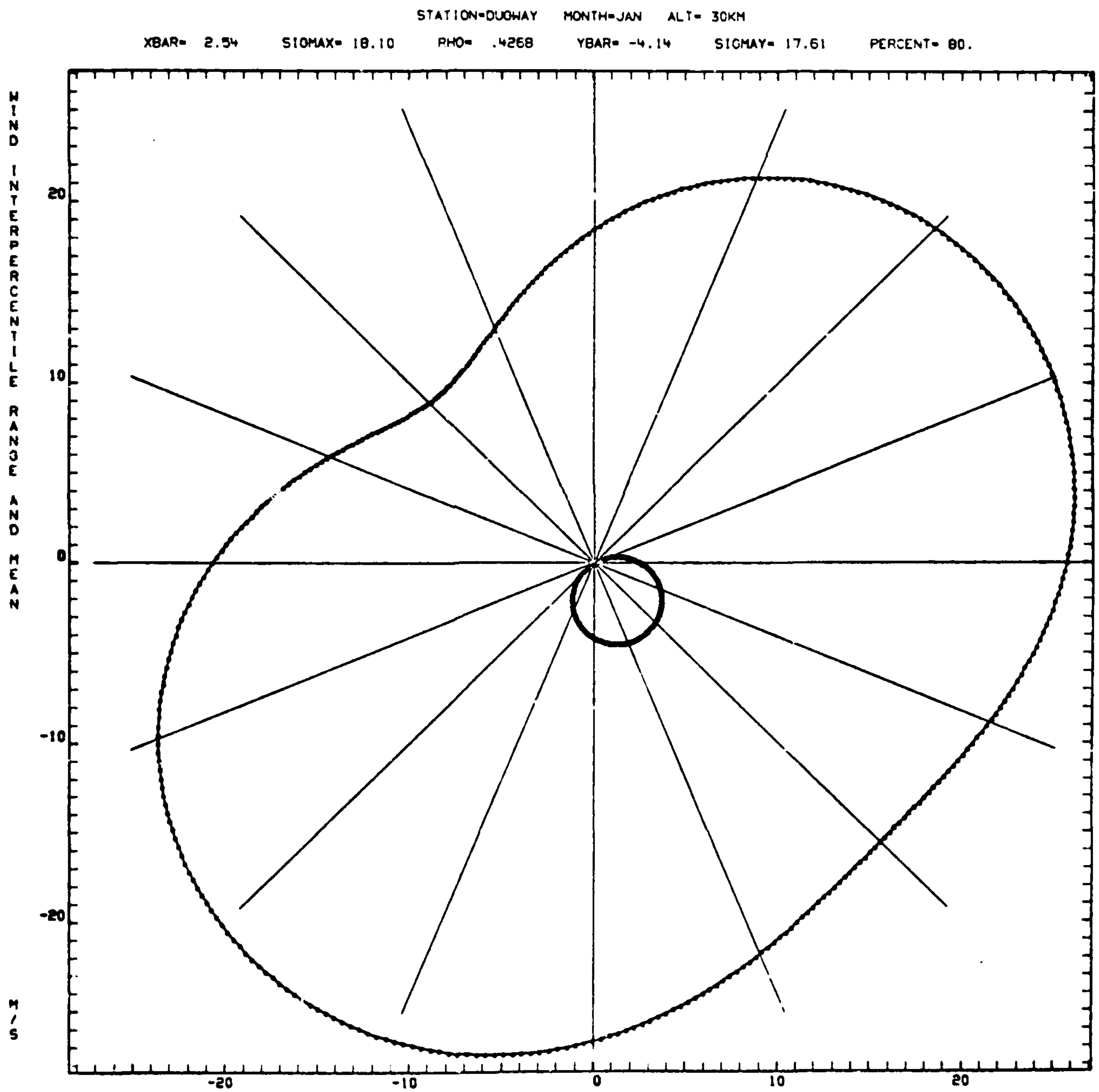

STATION=DUGWAY MONTH=JAN ALT= 30KM
XBAR= 2.54 SIGMAX= 18.10 RHO= .4268 YBAR= -4.14 SIGMAY= 17.61 PERCENT= 80.
WIND INTERPERCENTILE RANGE AND MEAN
M/S
20
10
0
-10
-20
-20
-10
0
10
20
M/S

Fig. A-27

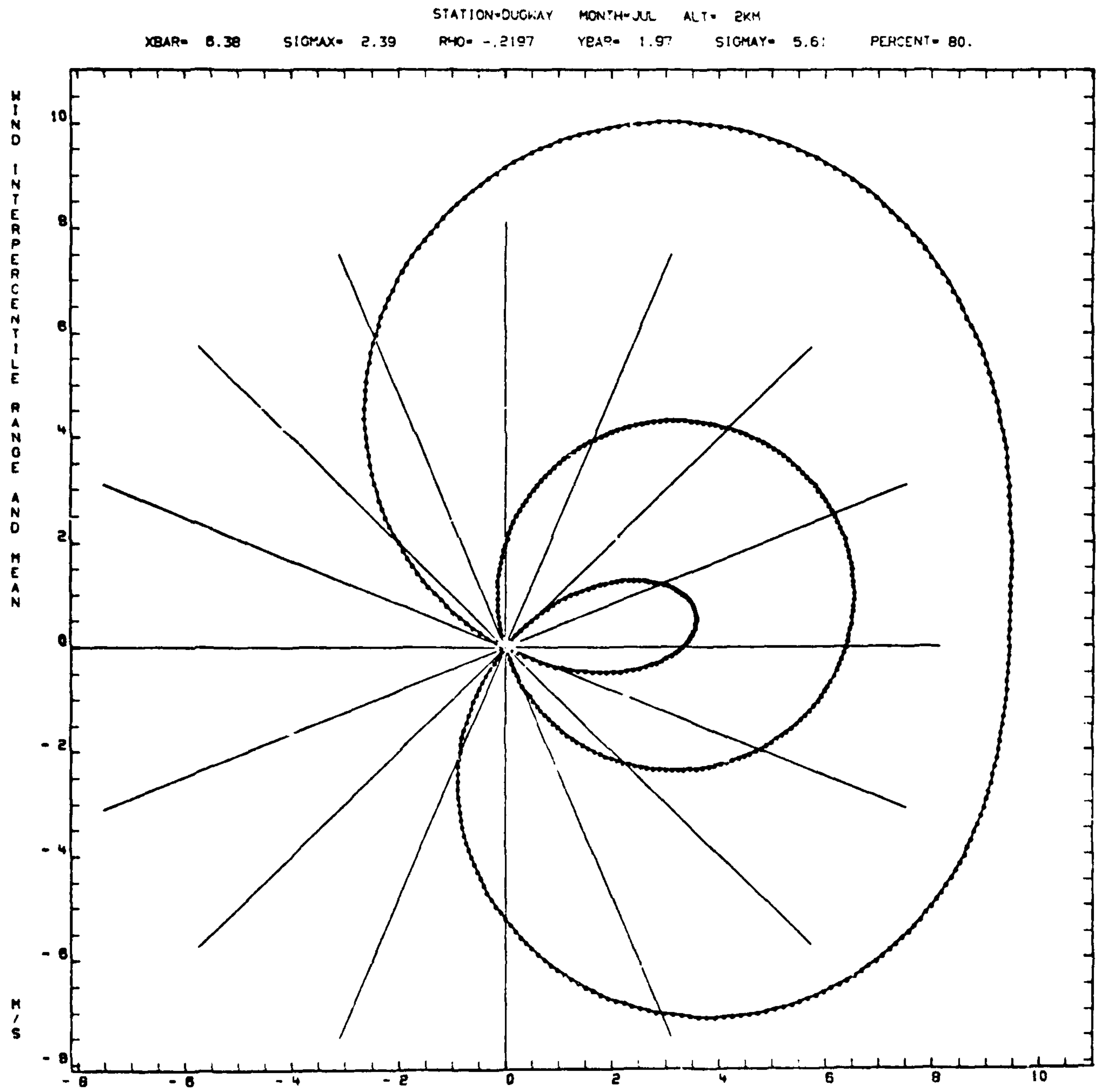

STATION=DUGWAY MONTH=JUL ALT= 2KM
XBAR= 6.38 SIGMAX= 2.39 RHO= -.2197 YBAR= 1.97 SIGMAY= 5.61 PERCENT= 80.
WIND INTERPERCENTILE RANGE AND MEAN
M/S
10
8
6
4
2
0
-2
-4
-6
-8
M/S

Fig. A-28

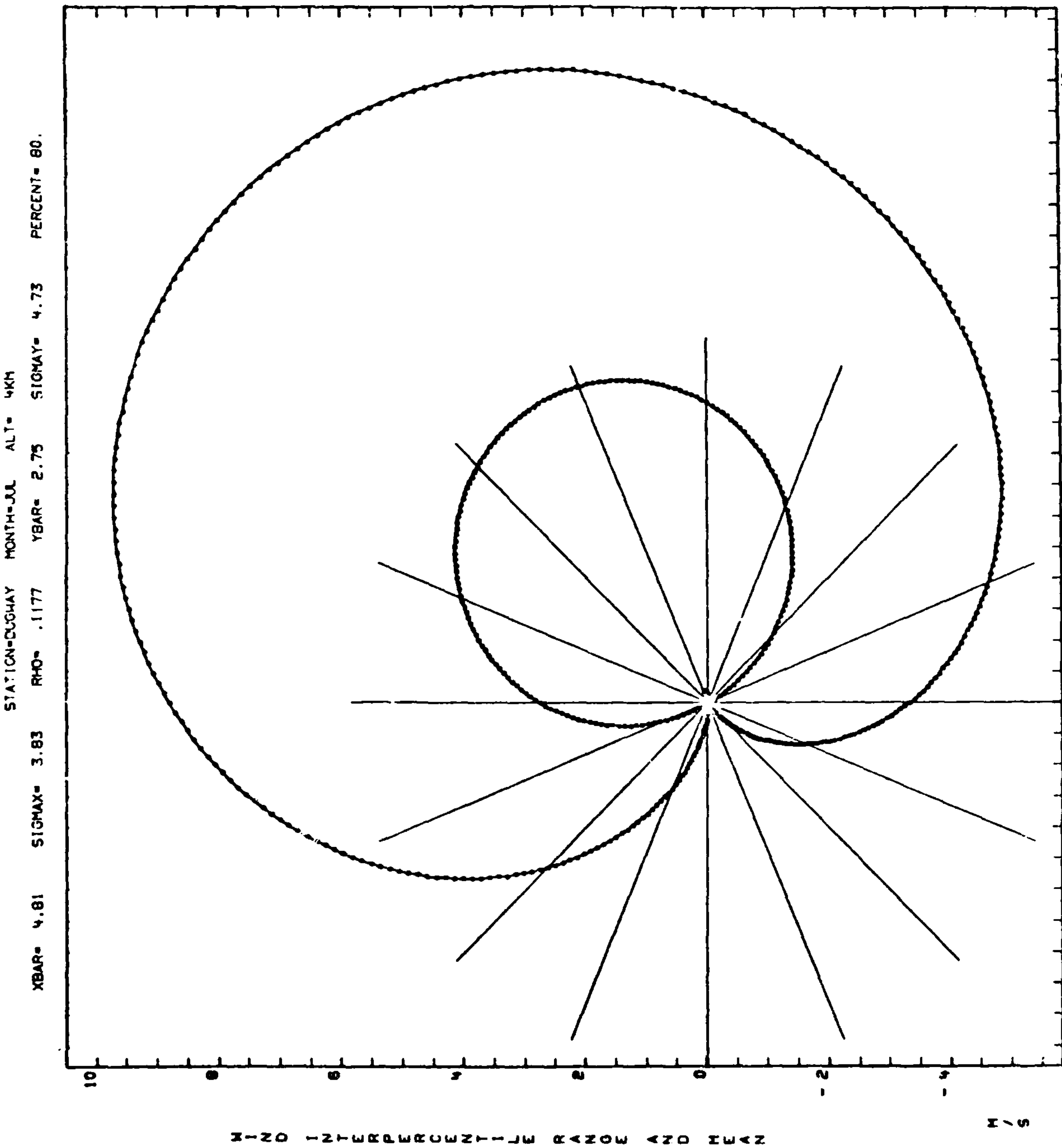

STATION=DUGWAY MONTH=JUL ALT= 4KM
XBAR= 4.81 SIGMAX= 3.83 RHO= .1177 YBAR= 2.75 SIGMAY= 4.73 PERCENT= 80.
M/S
M/S

Fig. A-29

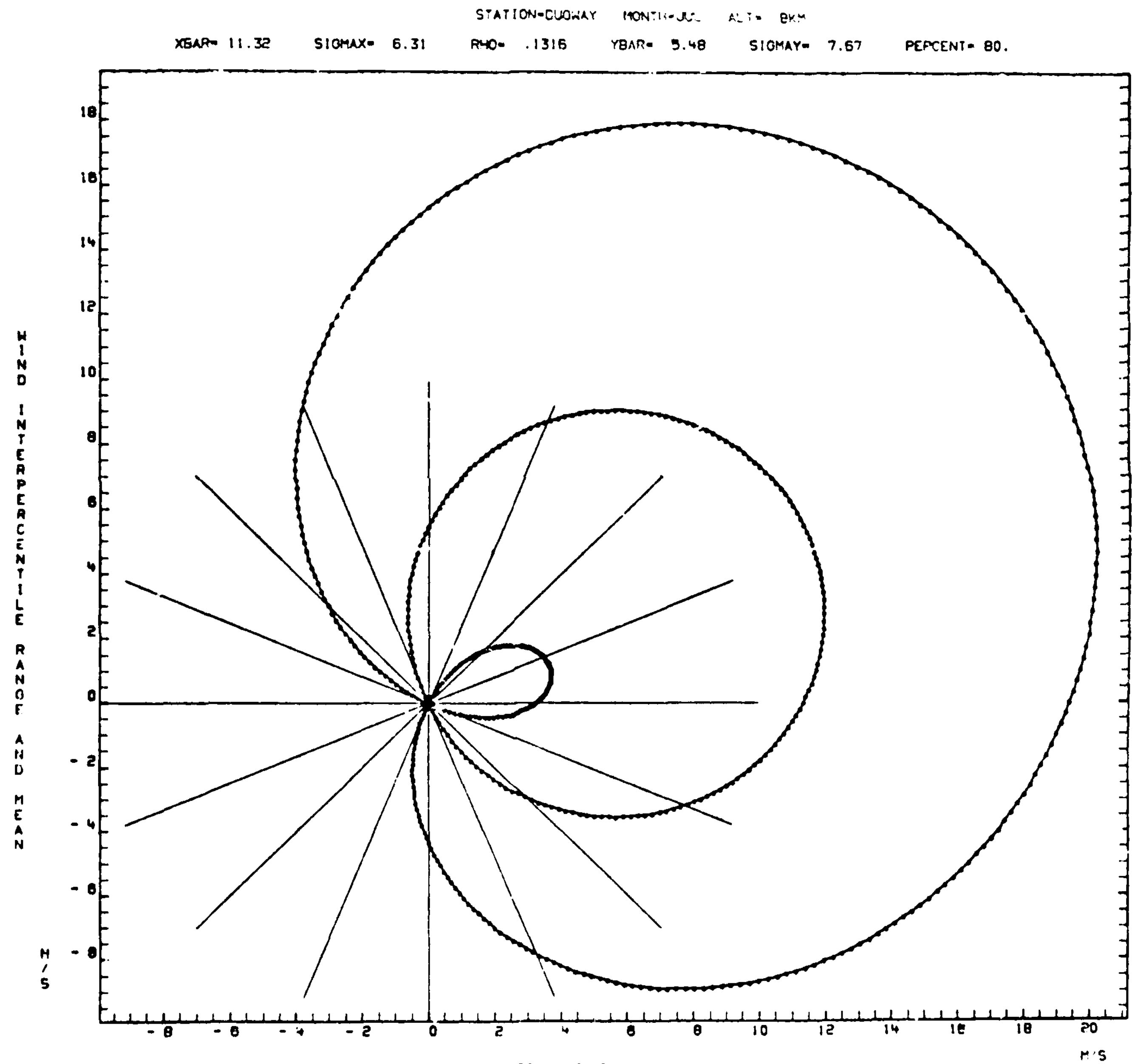
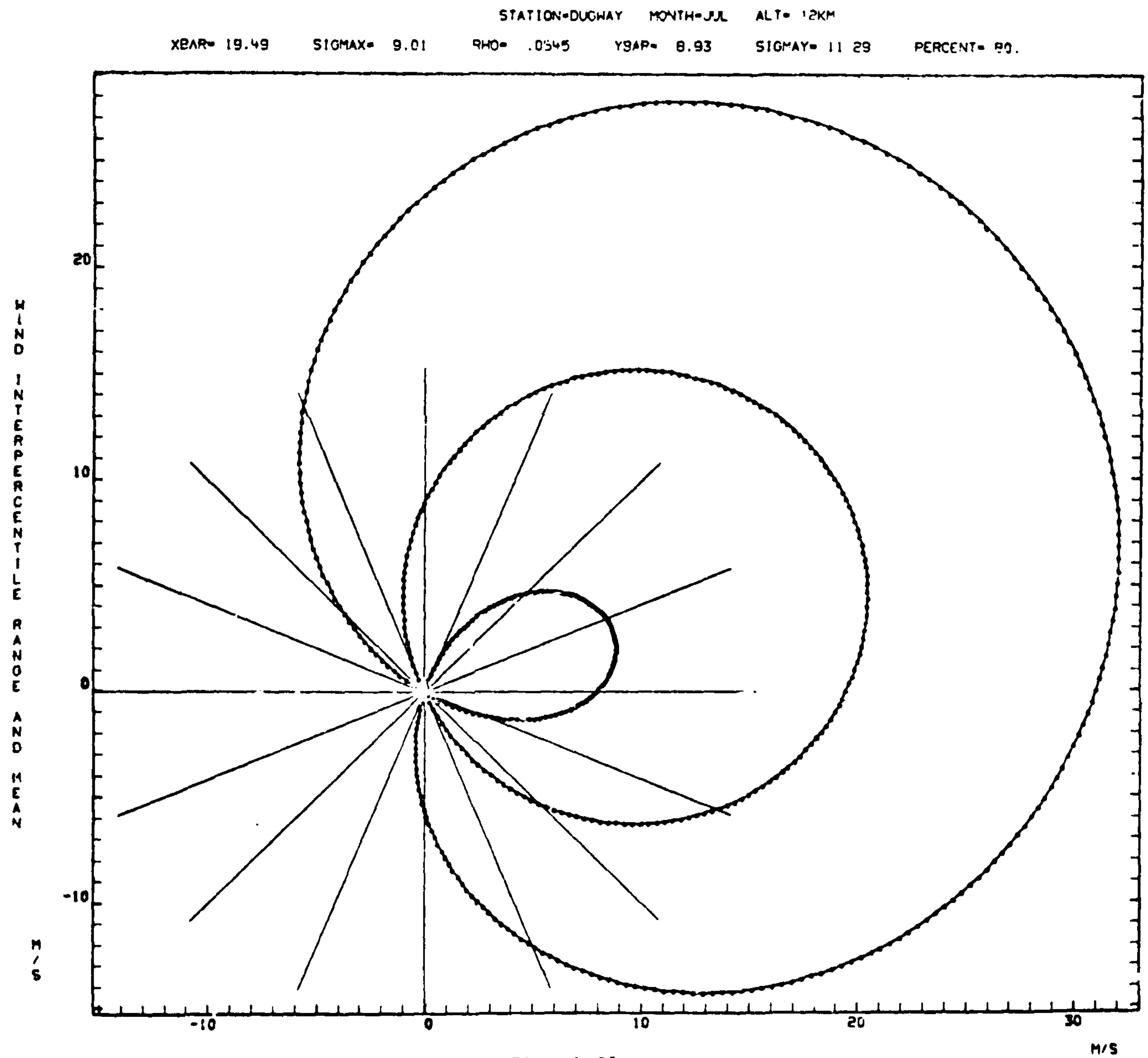

STATION=CUDWAY MONTH=JUL ALT= 8KM
XBAR= 11.32 SIGMAX= 6.31 RHO= .1316 YBAR= 5.48 SIGMAY= 7.67 PEPCENT= 80.
WIND INTERPERCENTILE RANGE AND MEAN
M/S
M/S

Fig. A-30



STATION=DUGWAY MONTH=JUL ALT= 12KM
XBAR= 19.49 SIGMAX= 9.01 RHO= .0545 YBAR= 8.93 SIGMAY= 11 29 PERCENT= 90.
20
10
0
-10
-10
0
10
20
30
M/S
WIND INTERPERCENTILE RANGE AND MEAN
M/S

Fig. A-31

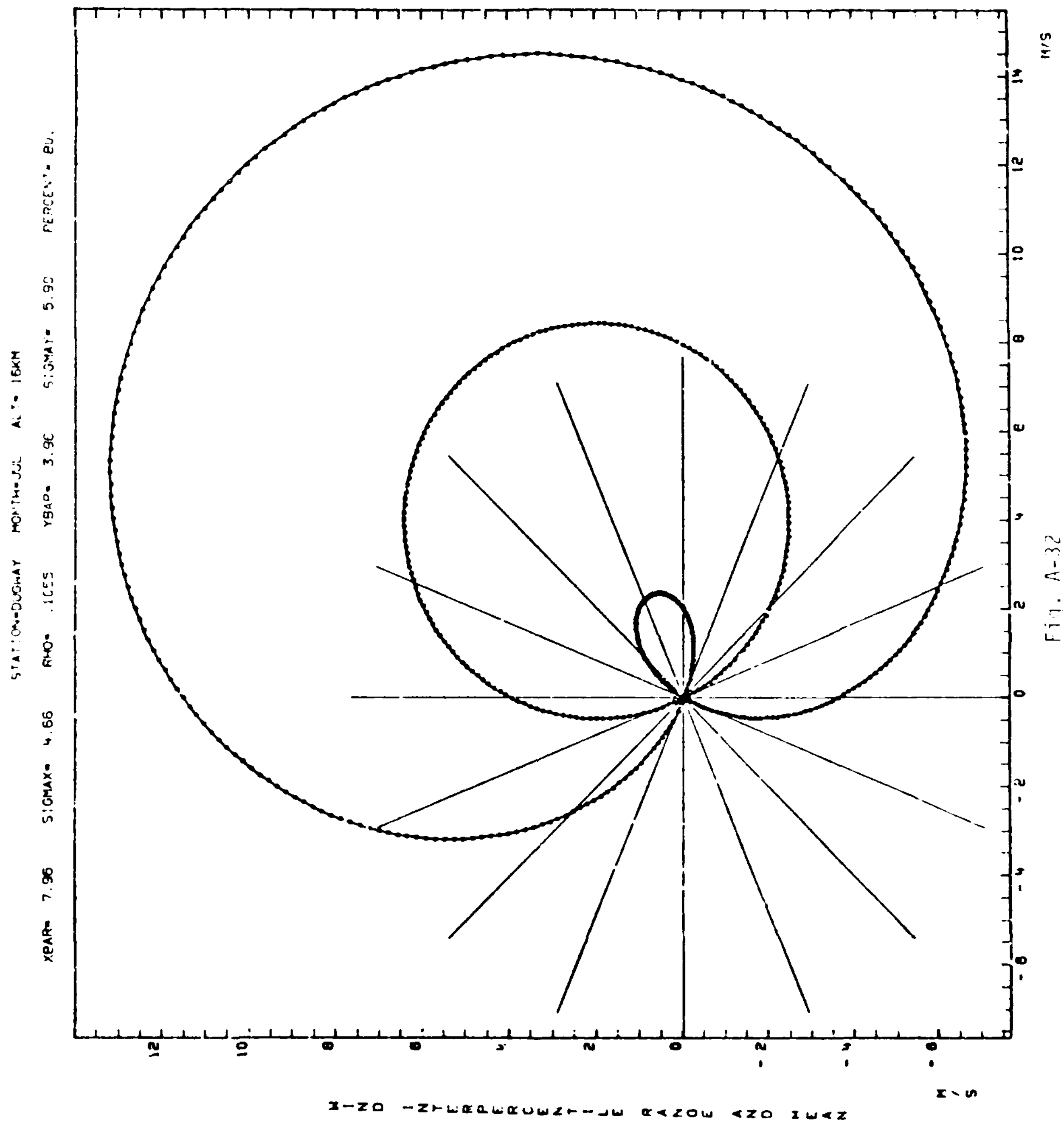
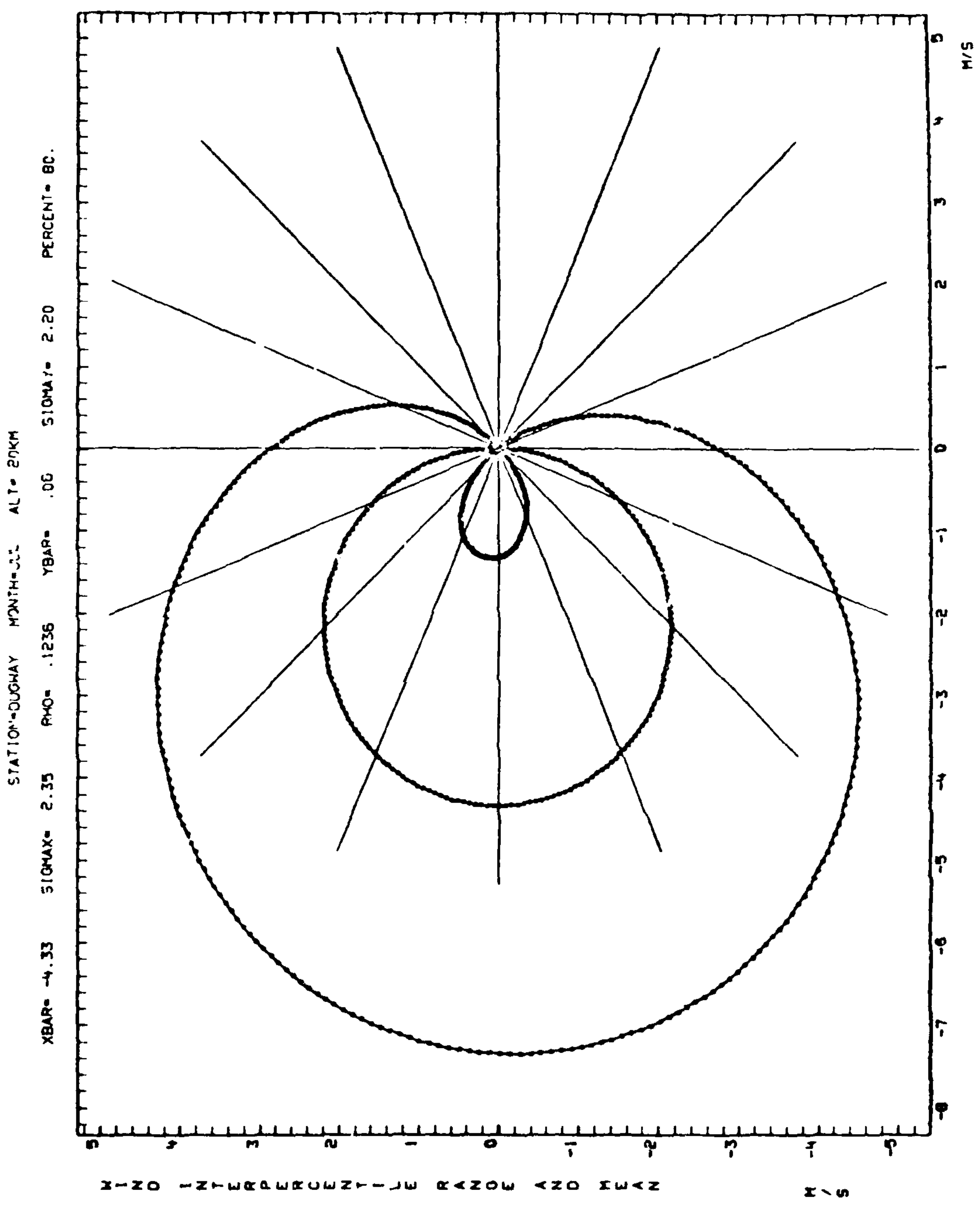

STATION=DUGWAY MONTH=JUL ALT= 16KM
XBAR= 7.96 SIGMAX= 4.66
YBAR= 3.90 SIGMAY= 5.90 PERCENT= 80.
M/S
M/S

Fig. A-32



STATION=DUGWAY ALT= 20KM
XBAR= -4.33 SIGMAX= 2.35 RHO= .1236 YBAR= .06 SIGMAY= 2.20 PERCENT= 80.
M/S

Fig. A-33

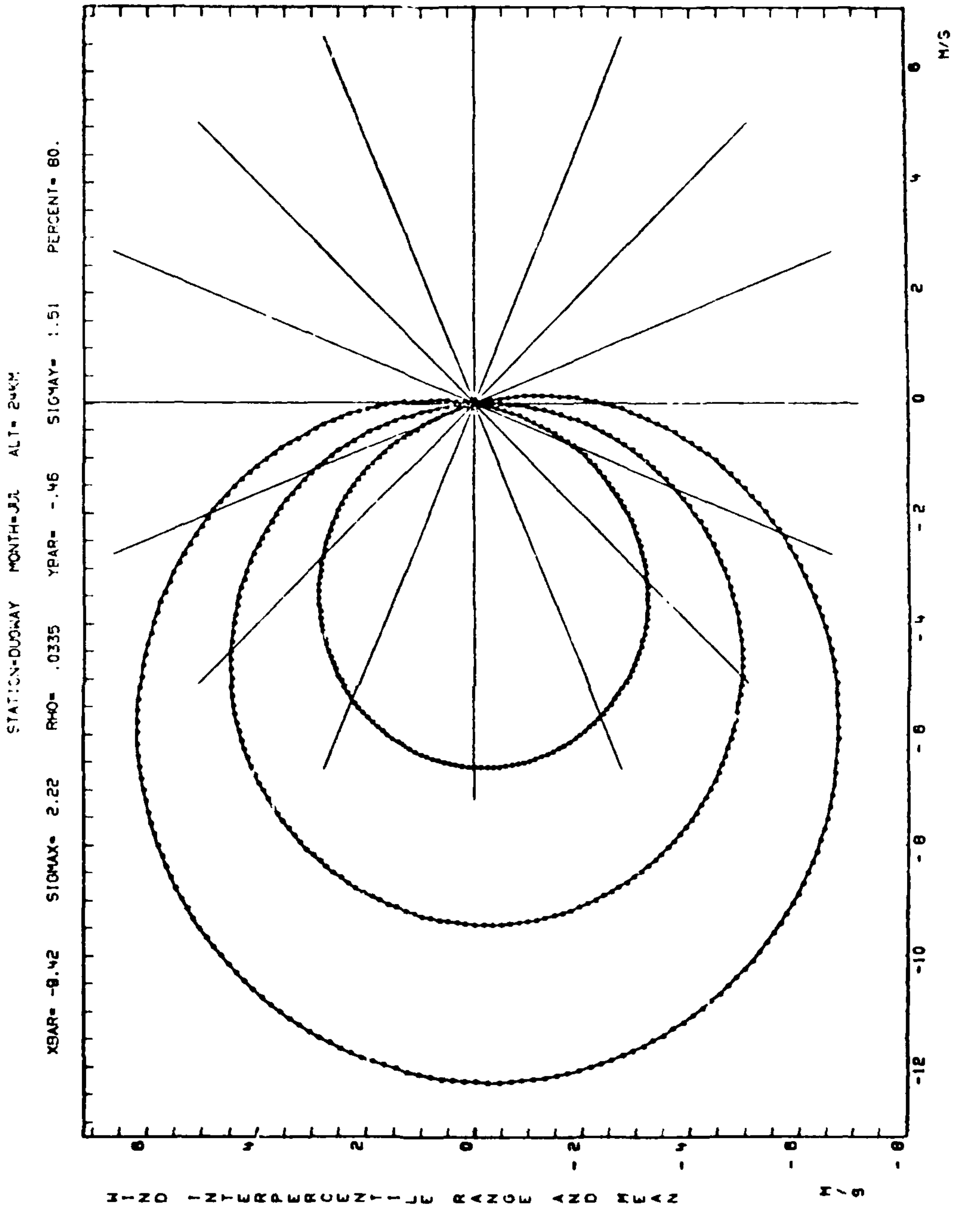

STATION=DUGWAY MONTH=JUL ALT= 24KM
XBAR= -8.42 SIGMAX= 2.22 RHO= .0335 YBAR= -.46 SIGMAY= 1.51 PERCENT= 80.
M/S

Fig. A-34

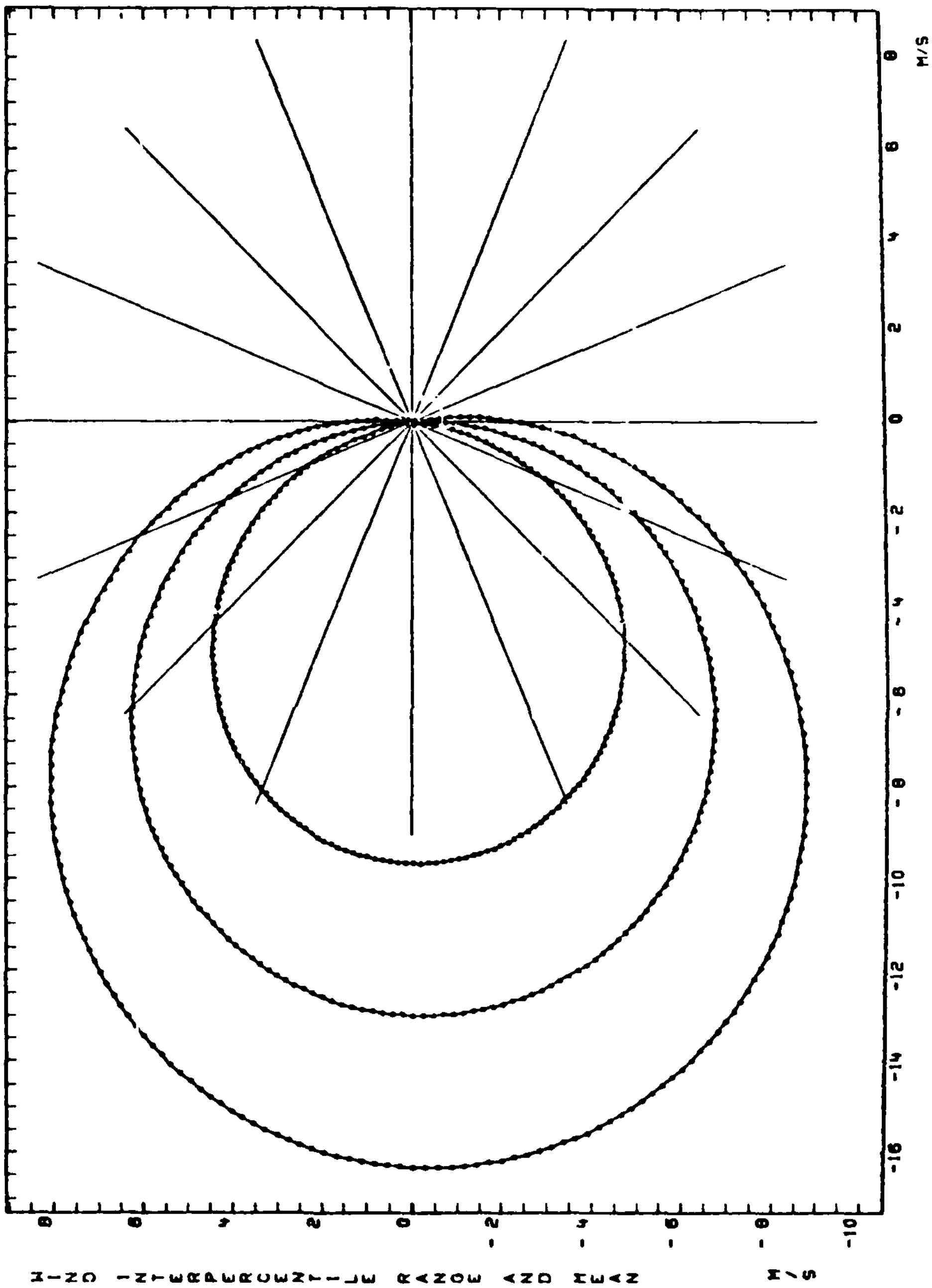

STATION=DUGWAY MONTH=JUL ALT= 28KM
XBAR=-12.99 SIGMAX= 2.60 PHO= .1226 YBAR= -.48 SIGMAY= 1.51 PERCENT= 80.
M/S
M/S

Fig. A-35

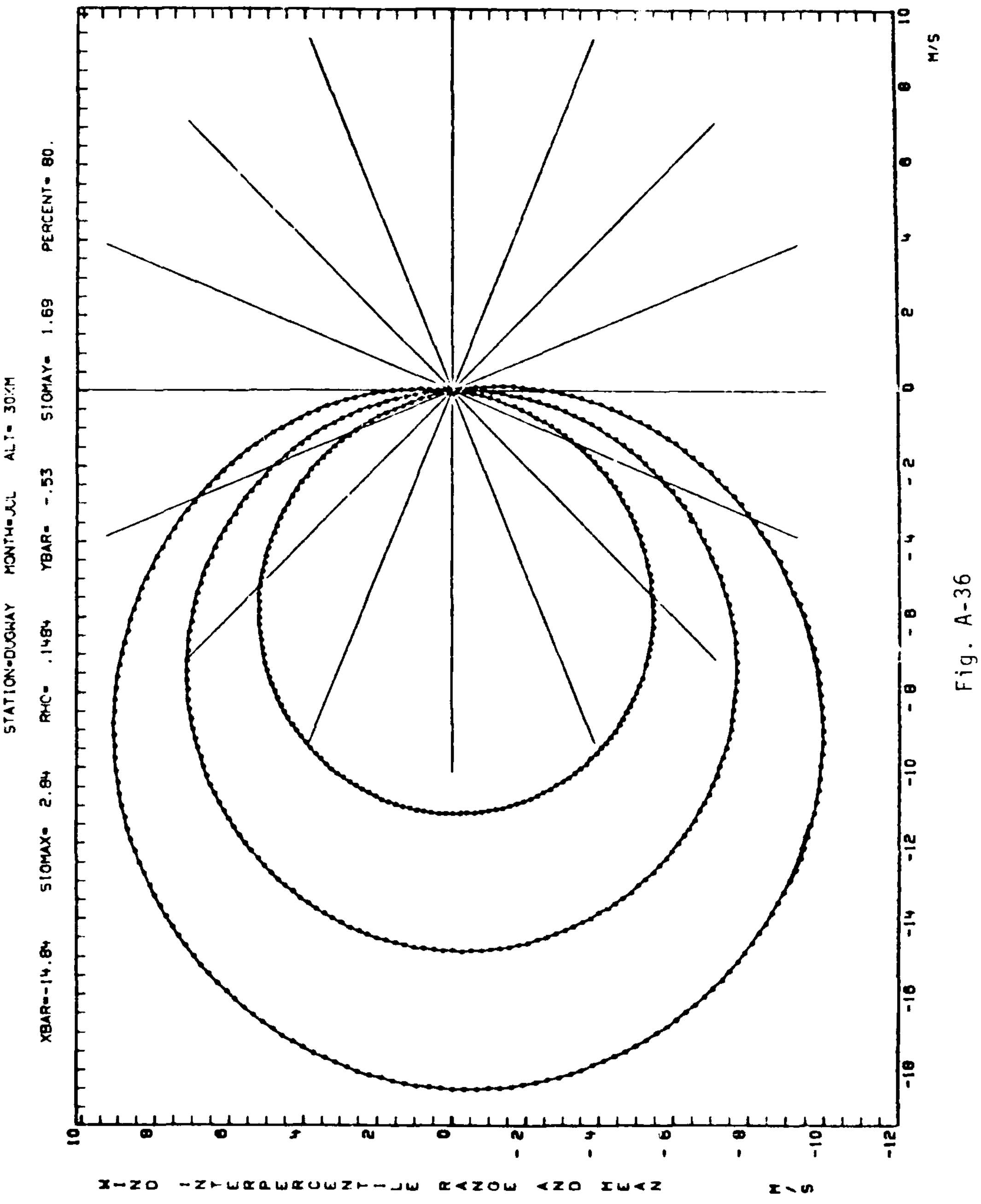

STATION=DUGWAY MONTH=JUL ALT= 30KM
XBAR=-14.84 SIGMAX= 2.84 RHO= .1484 YBAR= -.53 SIGMAY= 1.69 PERCENT= 80.
M/S
M/S

Fig. A-36

STATION=DUGWAY MONTH=JAN ALT= 2KM

WIND PROBABILITY ELLIPSES

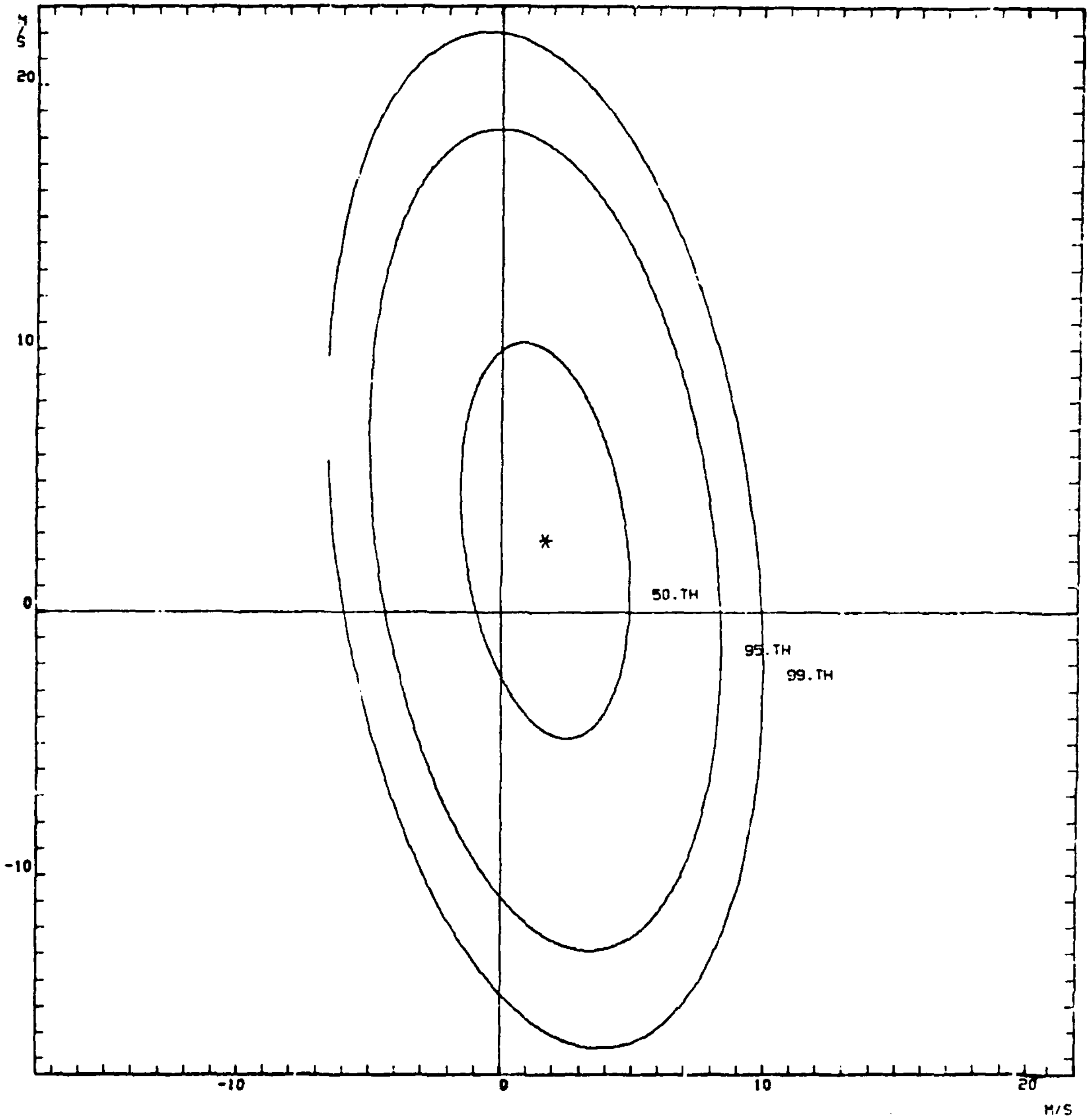


Fig. A-37

STATION=DUGWAY MONTH=JAN ALT= 4KM

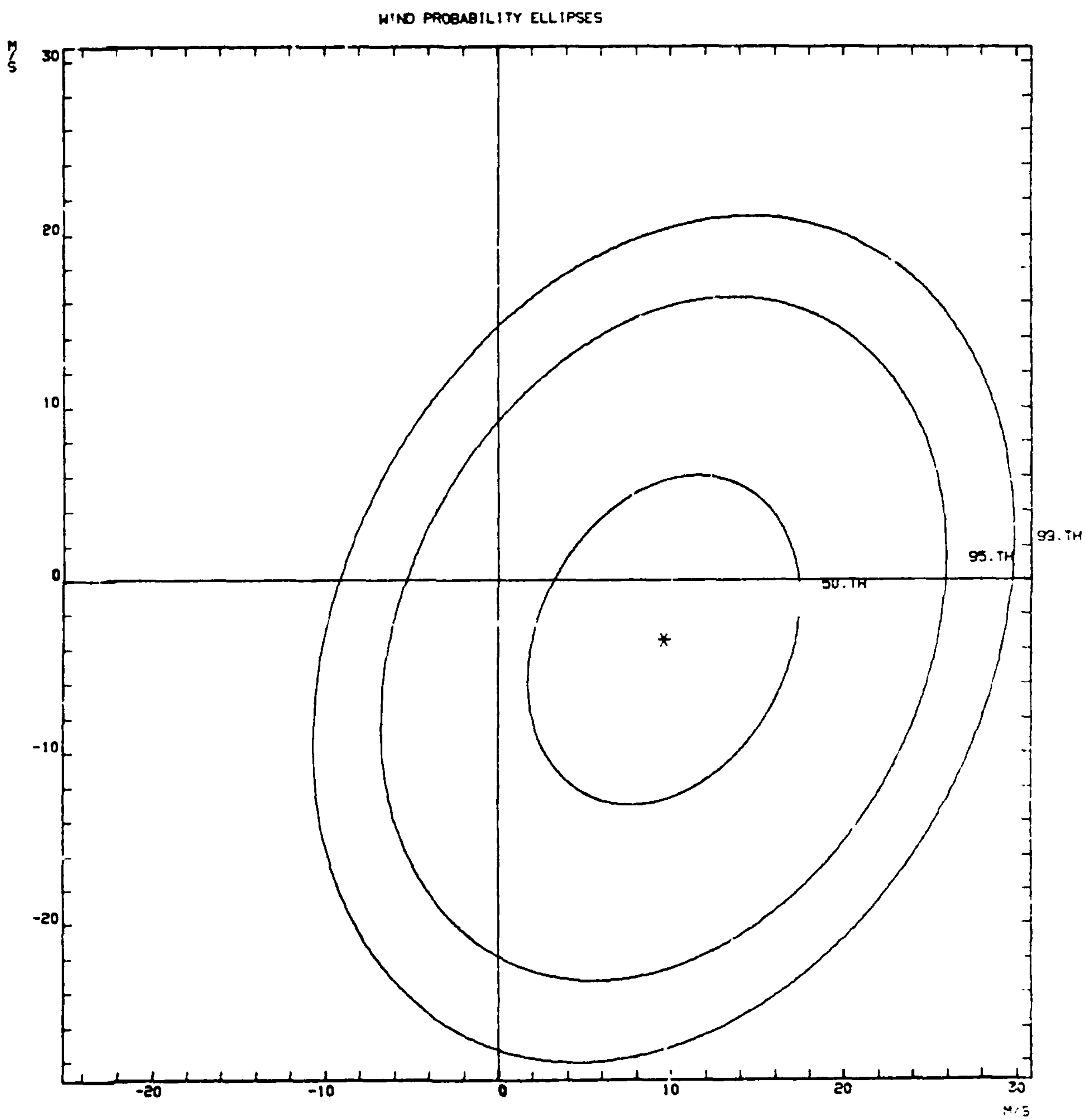


Fig. A-38

STATION=CUGWAY MONTH=JAN ALT= 8KM

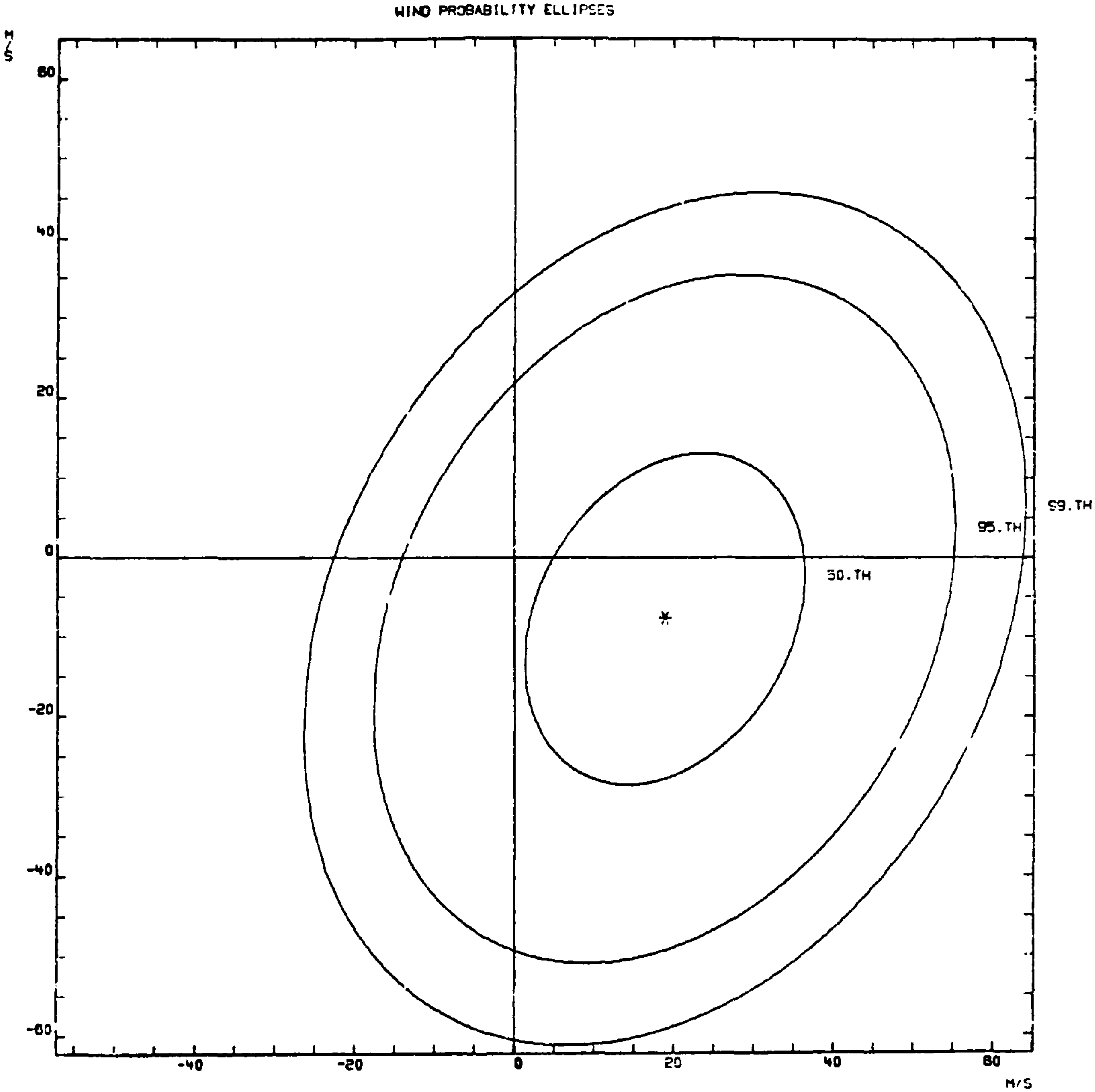


Fig. A-39

STATION=DUGWAY   MONTH=JAN   ALT= 12KM

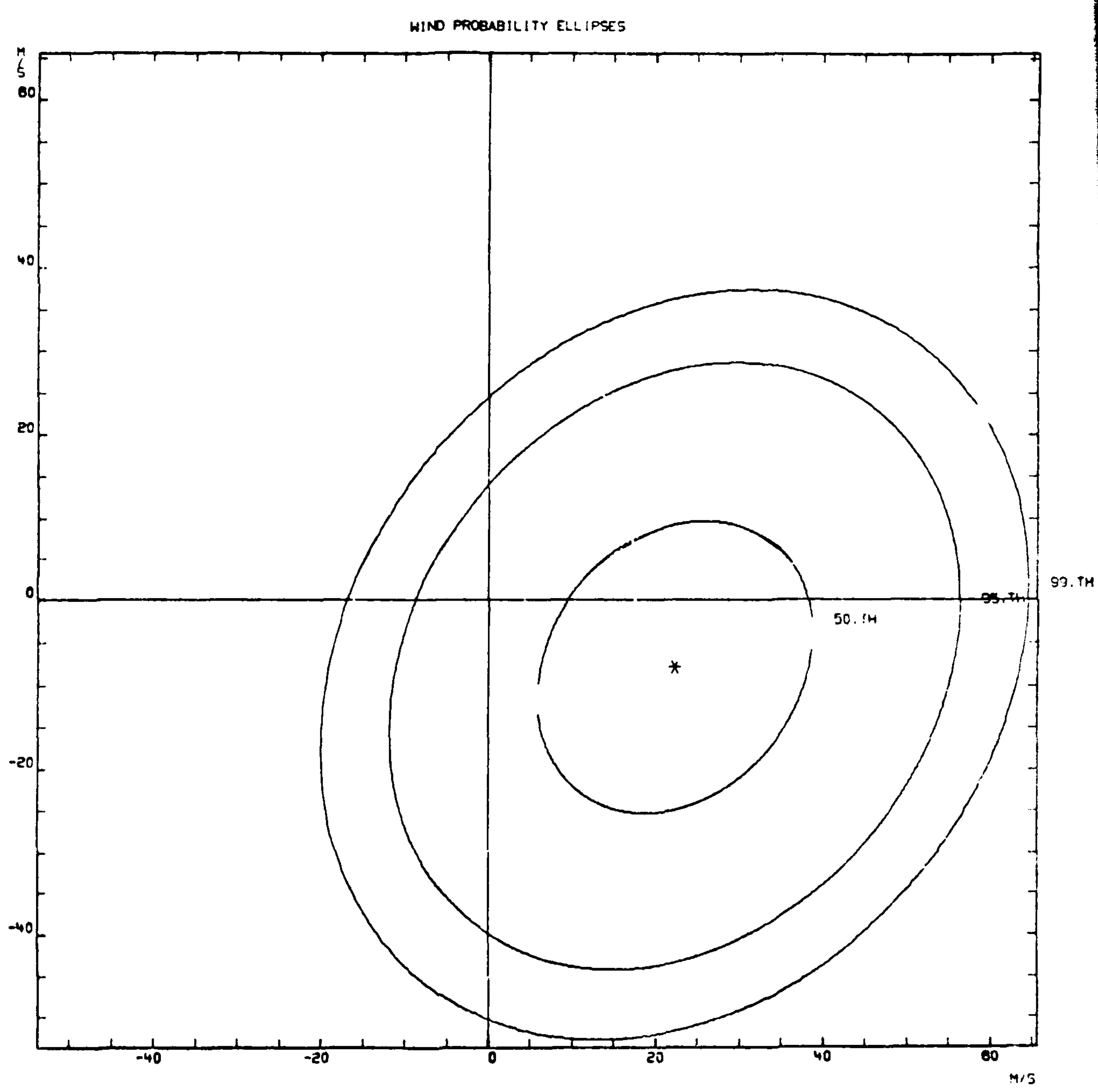


Fig. A-40

STATION=DUGWAY MONTH=JAN ALT= 16KM

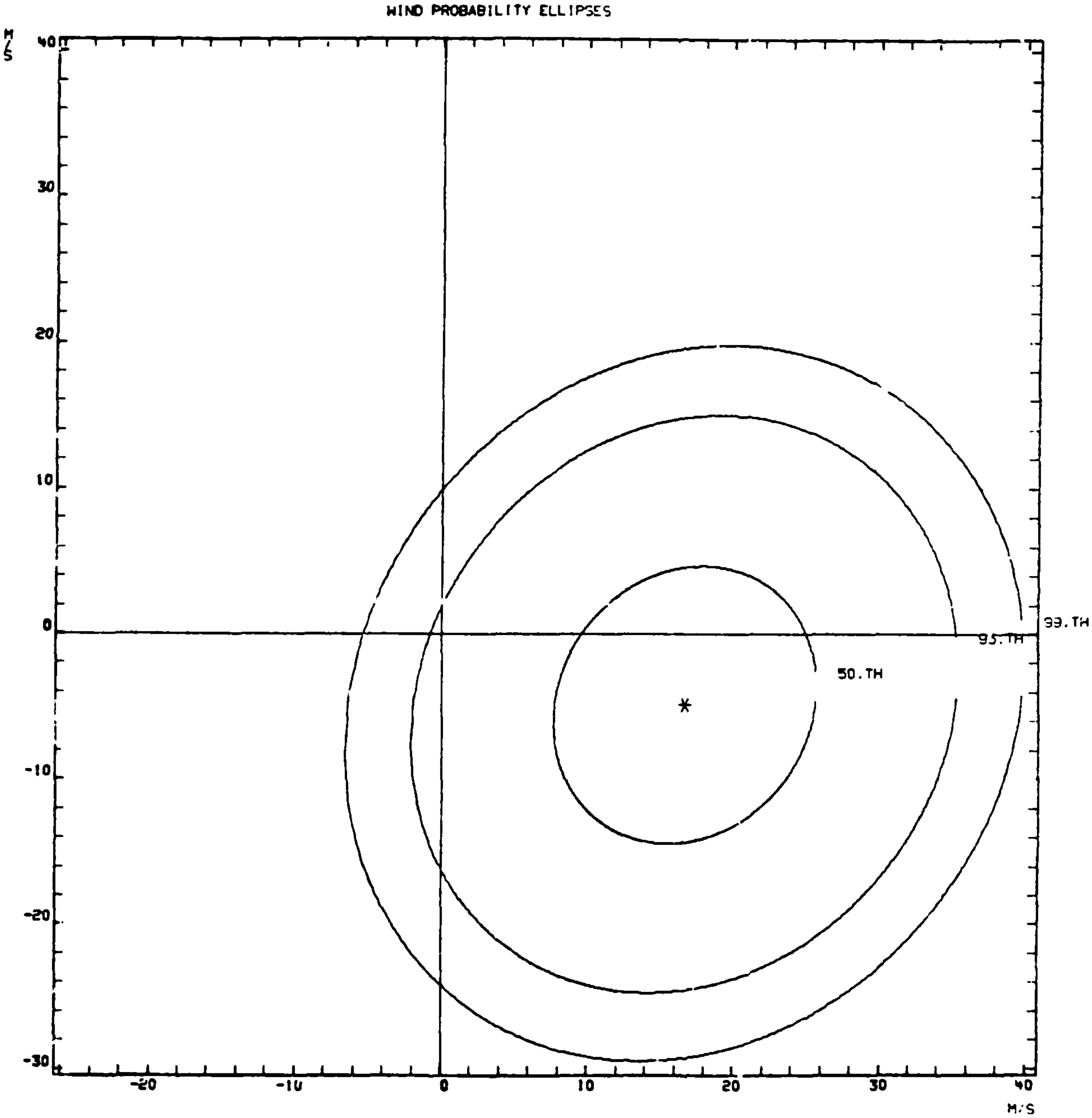


Fig. A-41

STATION=DUGWAY MONTH=JAN ALT= 23KM

WIND PROBABILITY ELLIPSES

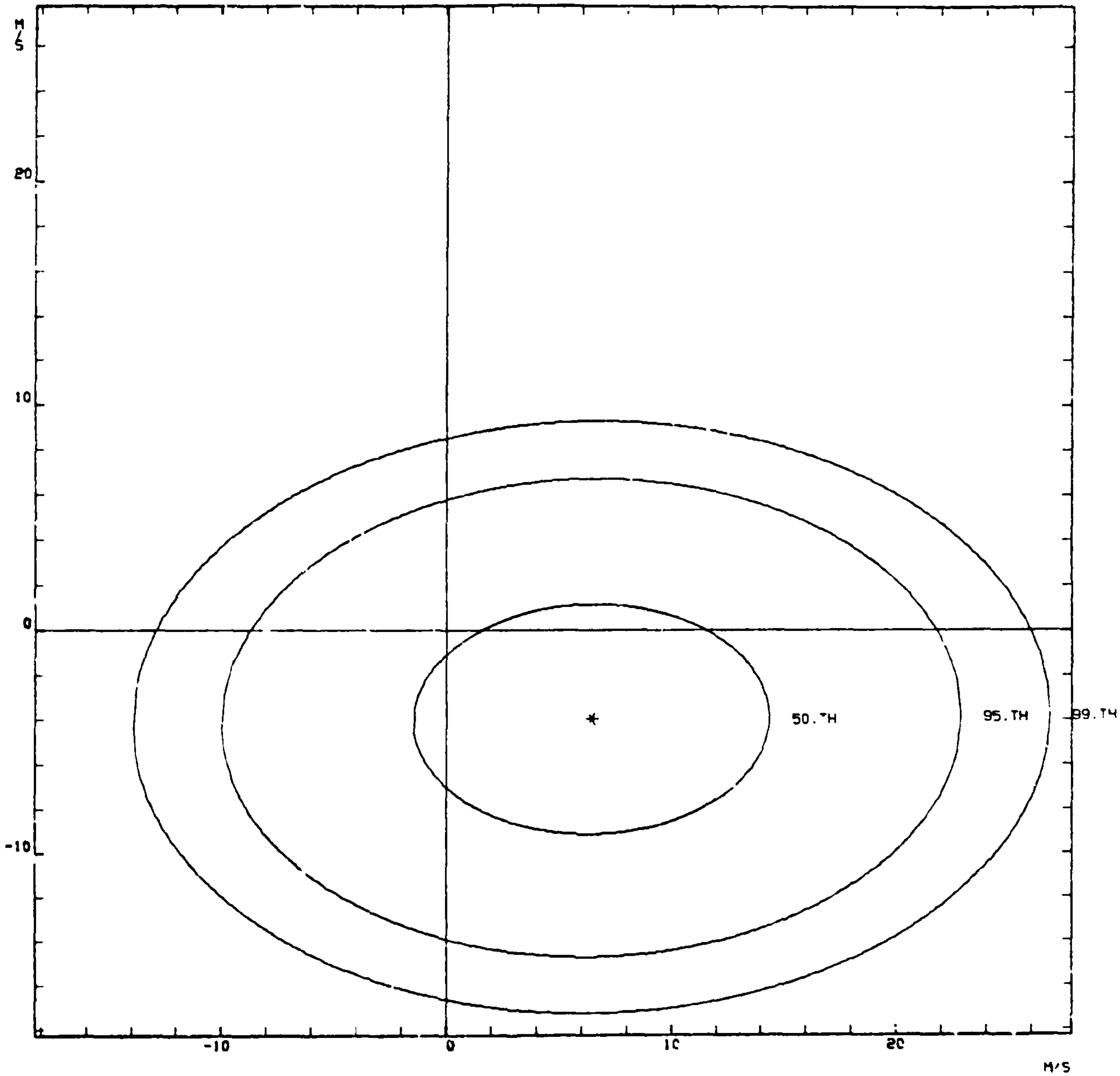


Fig. A-42

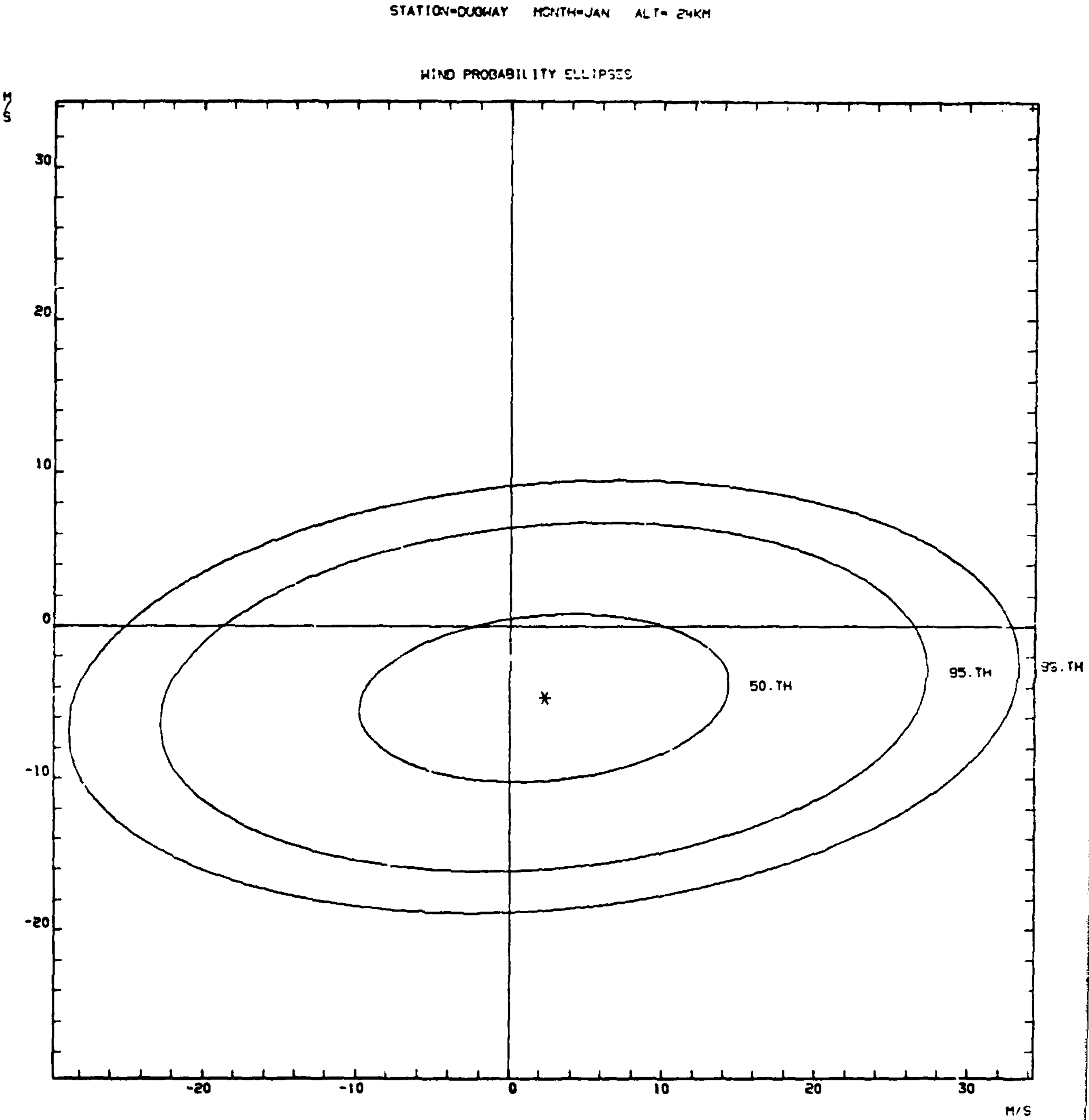

STATION=DUGWAY MONTH=JAN ALT= 24KM
WIND PROBABILITY ELLIPSES
M/S
30
20
10
0
-10
-20
-20
-10
0
10
20
30
M/S
50.TH
95.TH

Fig. A-43

STATION=DUGWAY   MONTH=JAN   ALT= 28KM

WIND PROBABILITY ELLIPSES

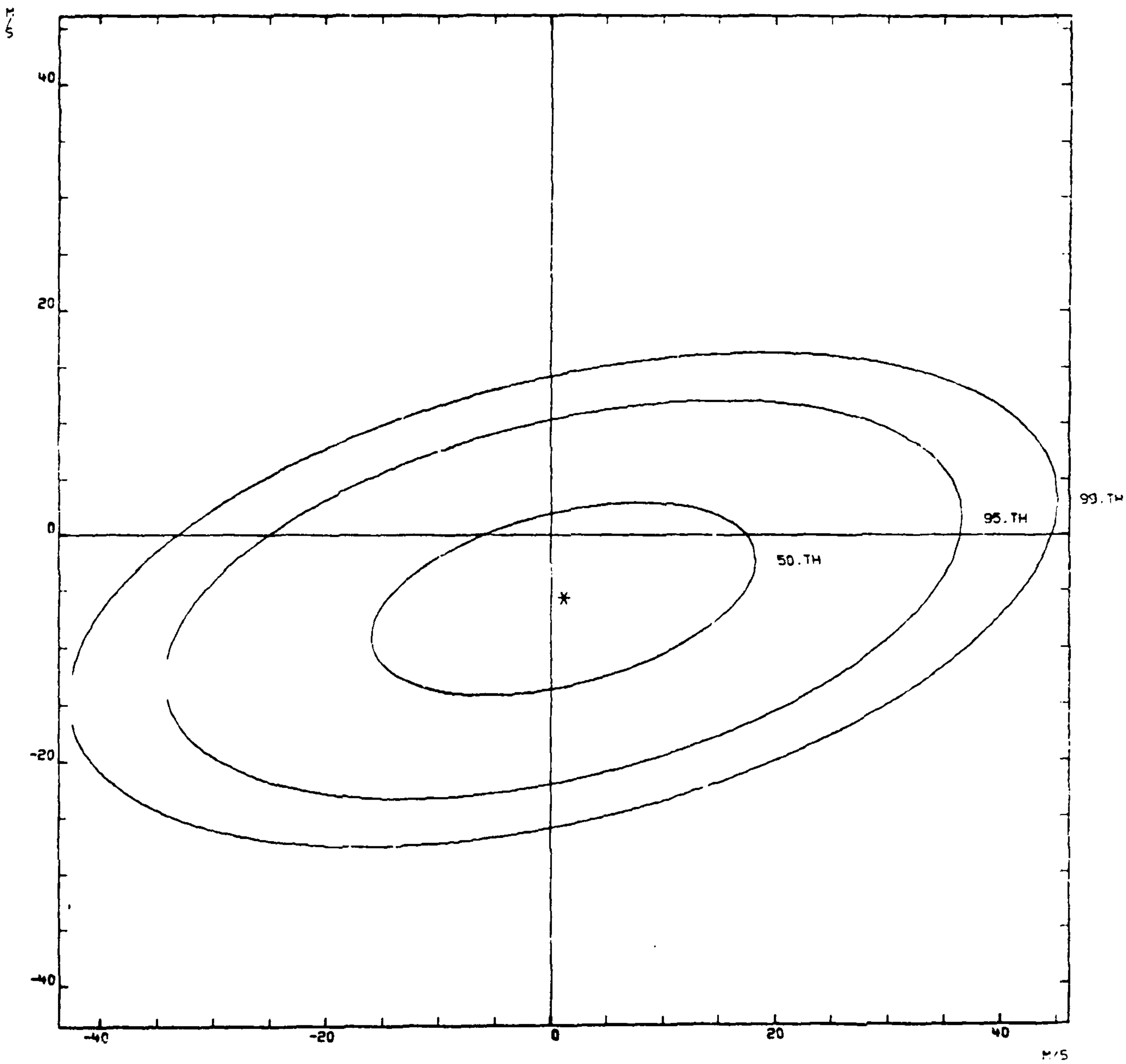


Fig. A-44

STATION=DUGWAY MONTH=JAN ALT= 30KM

WIND PROBABILITY ELLIPSES

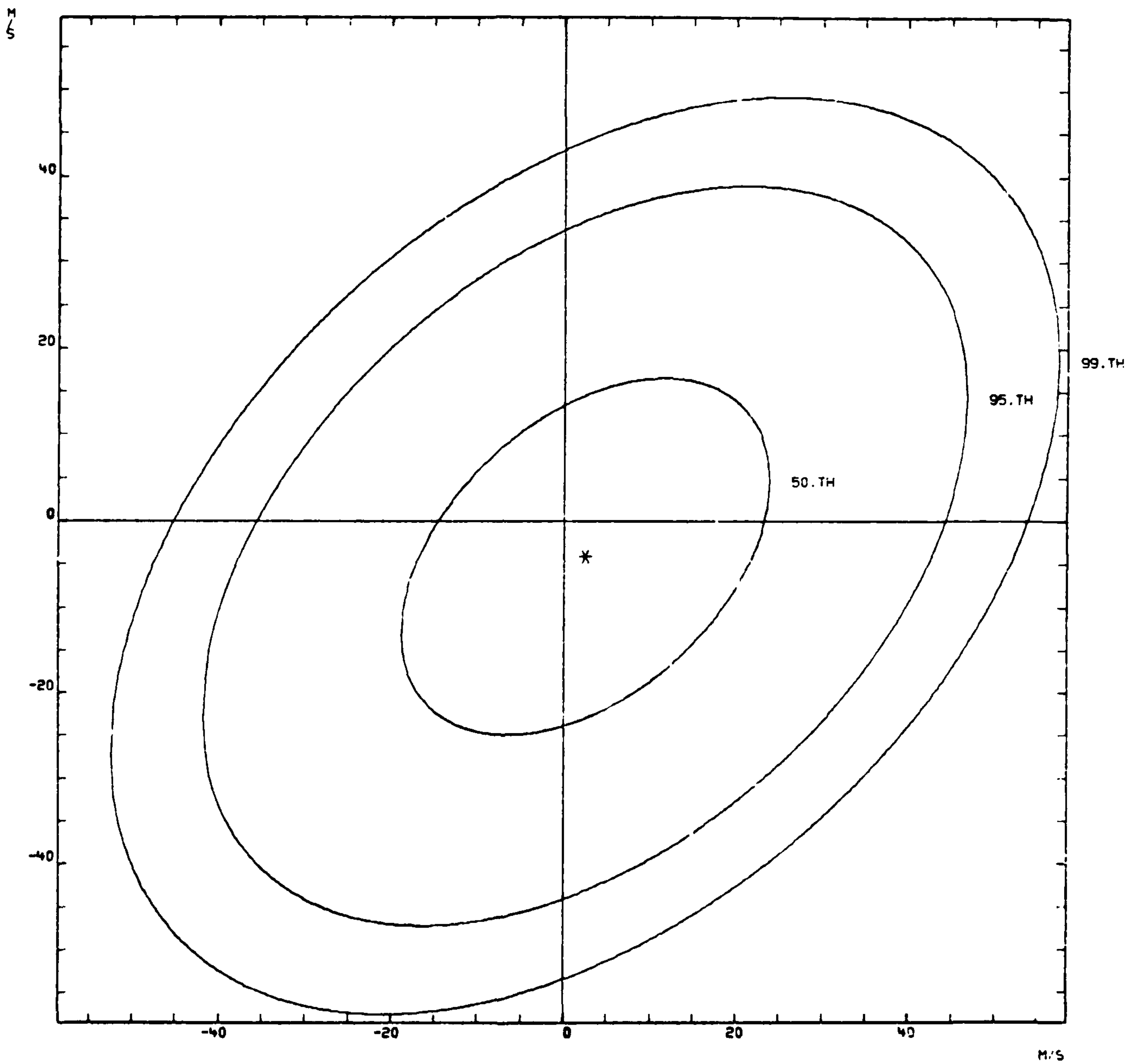


Fig. A-45

STATION=DUGWAY MONTH=JUL ALT= 2KM

WIND PROBABILITY ELLIPSES

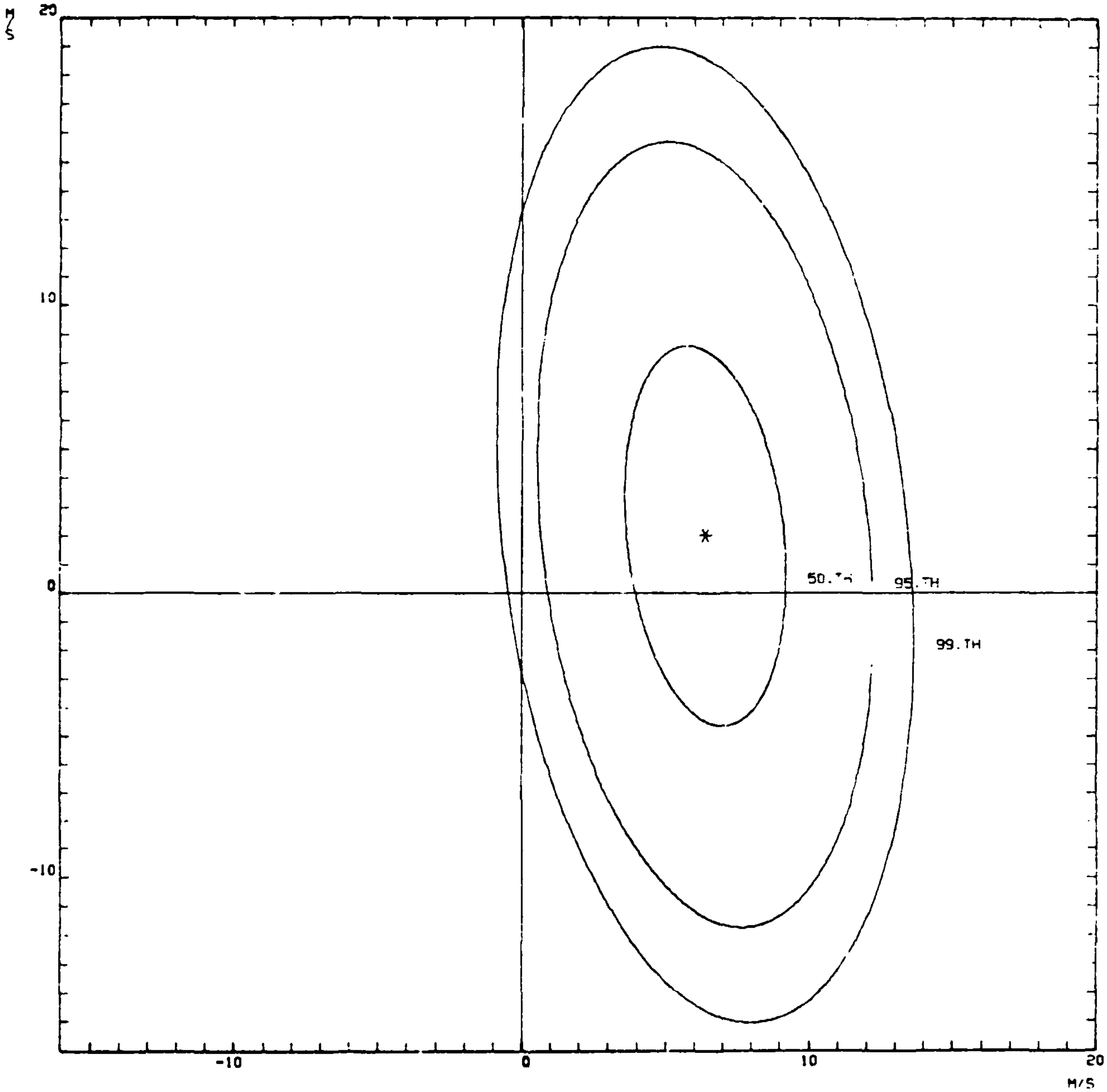


Fig. A-46

STATION=DUGWAY MONTH=JUL ALT= 4KM

WIND PROBABILITY ELLIPSES

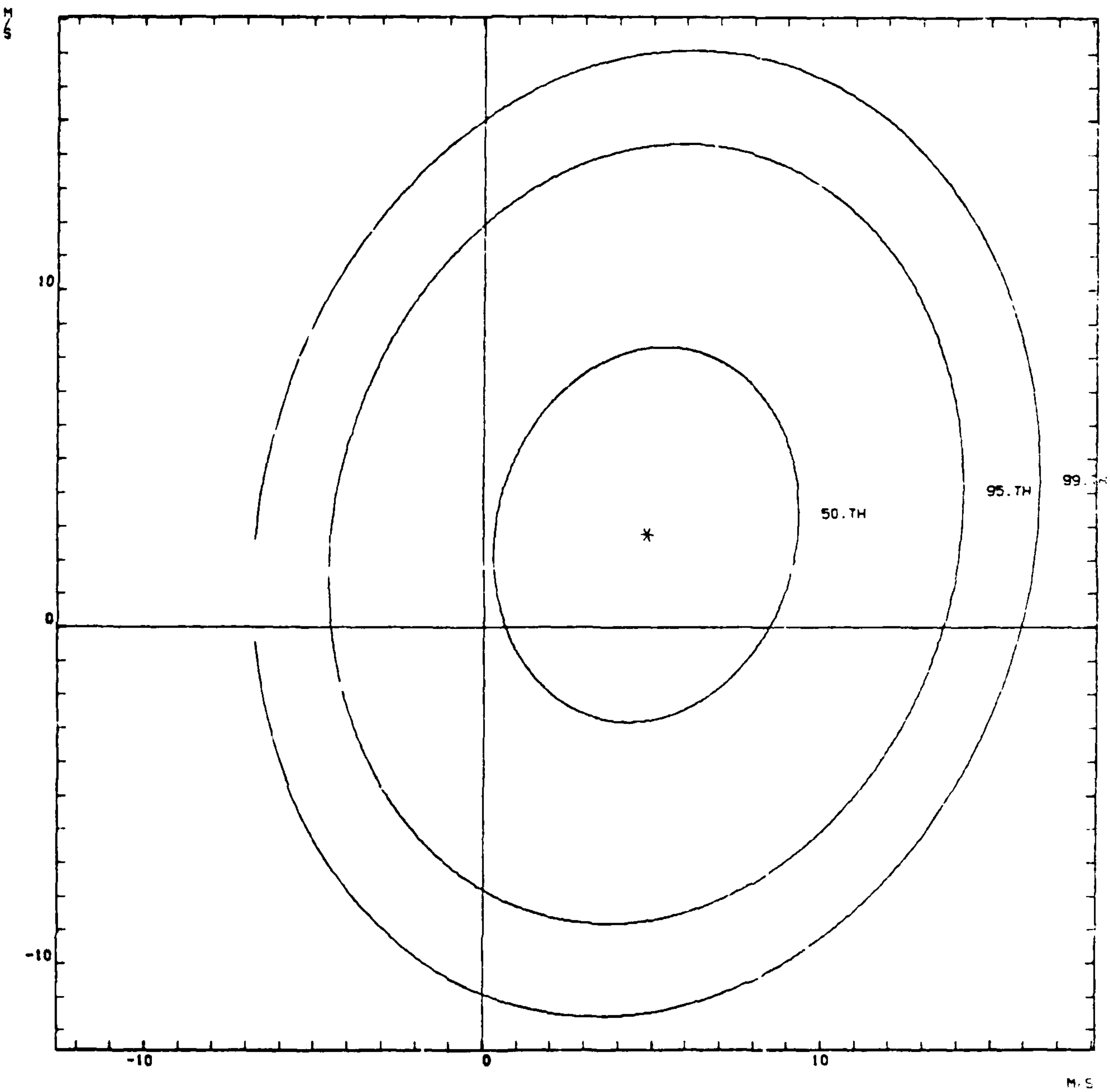
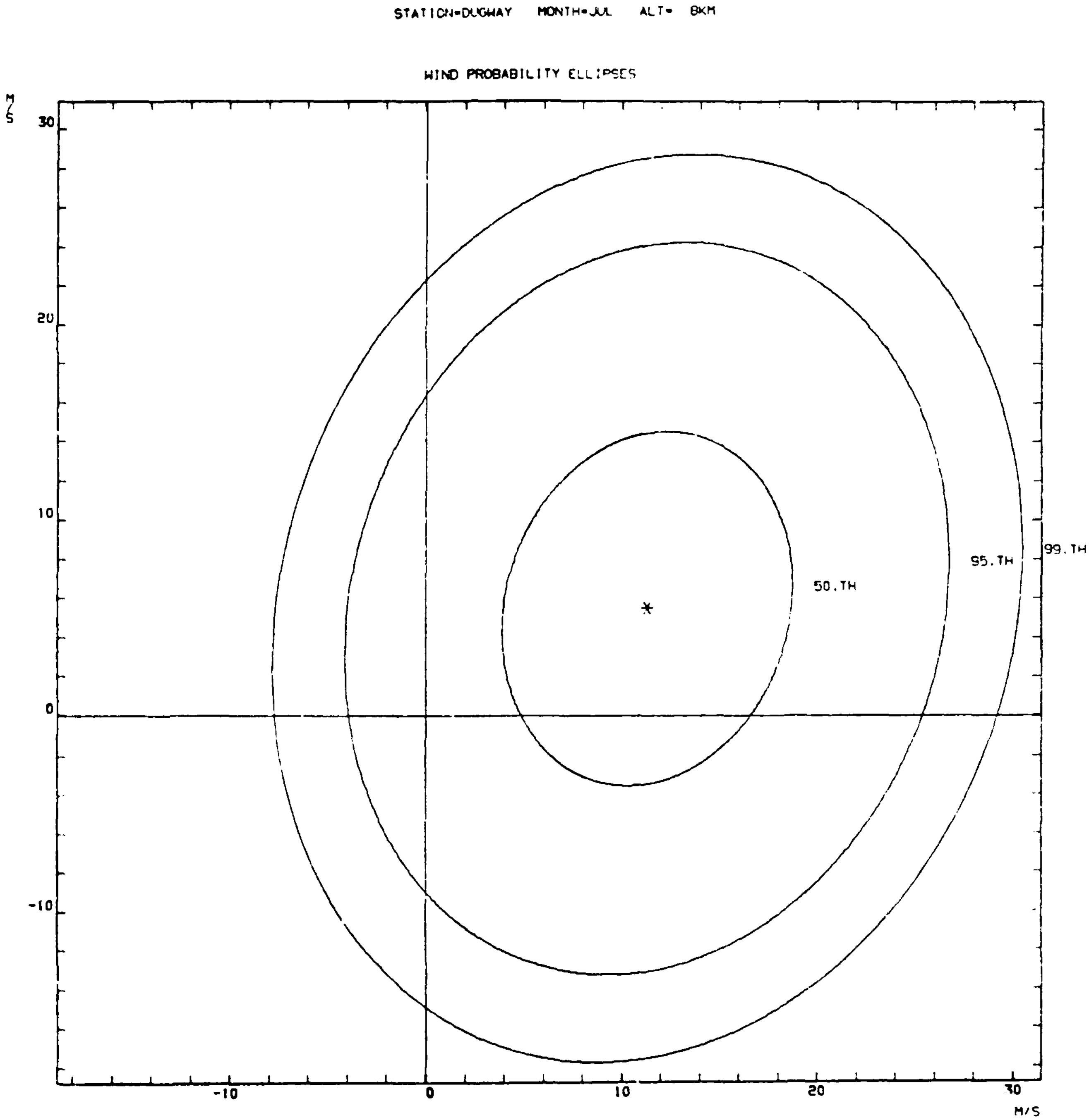


Fig. A-47



STATION=DUGWAY MONTH=JUL ALT= 8KM
WIND PROBABILITY ELLIPSES
M/S
30
20
10
0
-10
-10
0
10
20
30
M/S
50.TH
95.TH
99.TH

Fig. A-48

STATION=CUDWAY MONTH=JUL ALT= 12KM

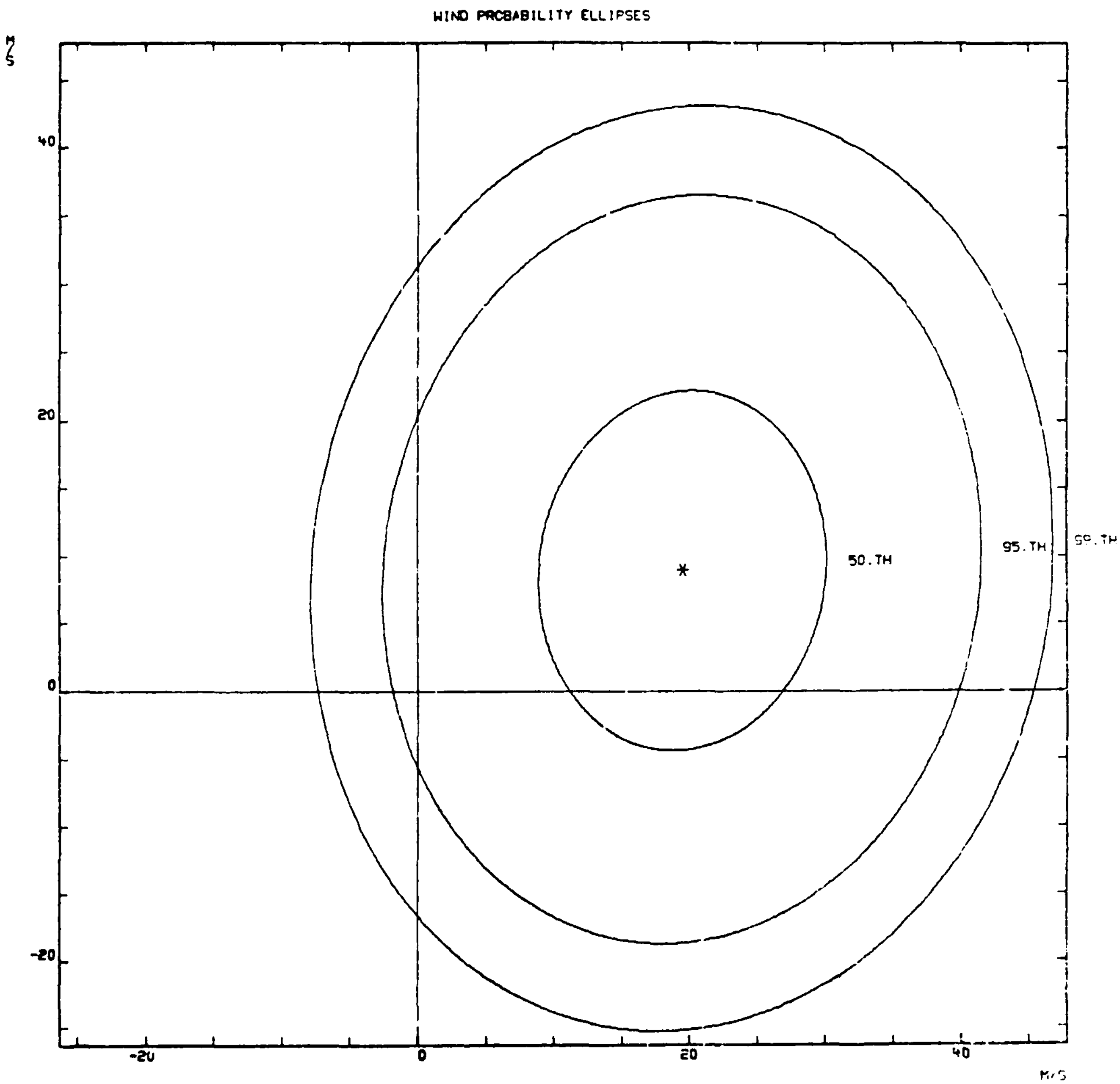


Fig. A-49

STATION=DUGWAY MONTH=JUL ALT= 16KM

WIND PROBABILITY ELLIPSES

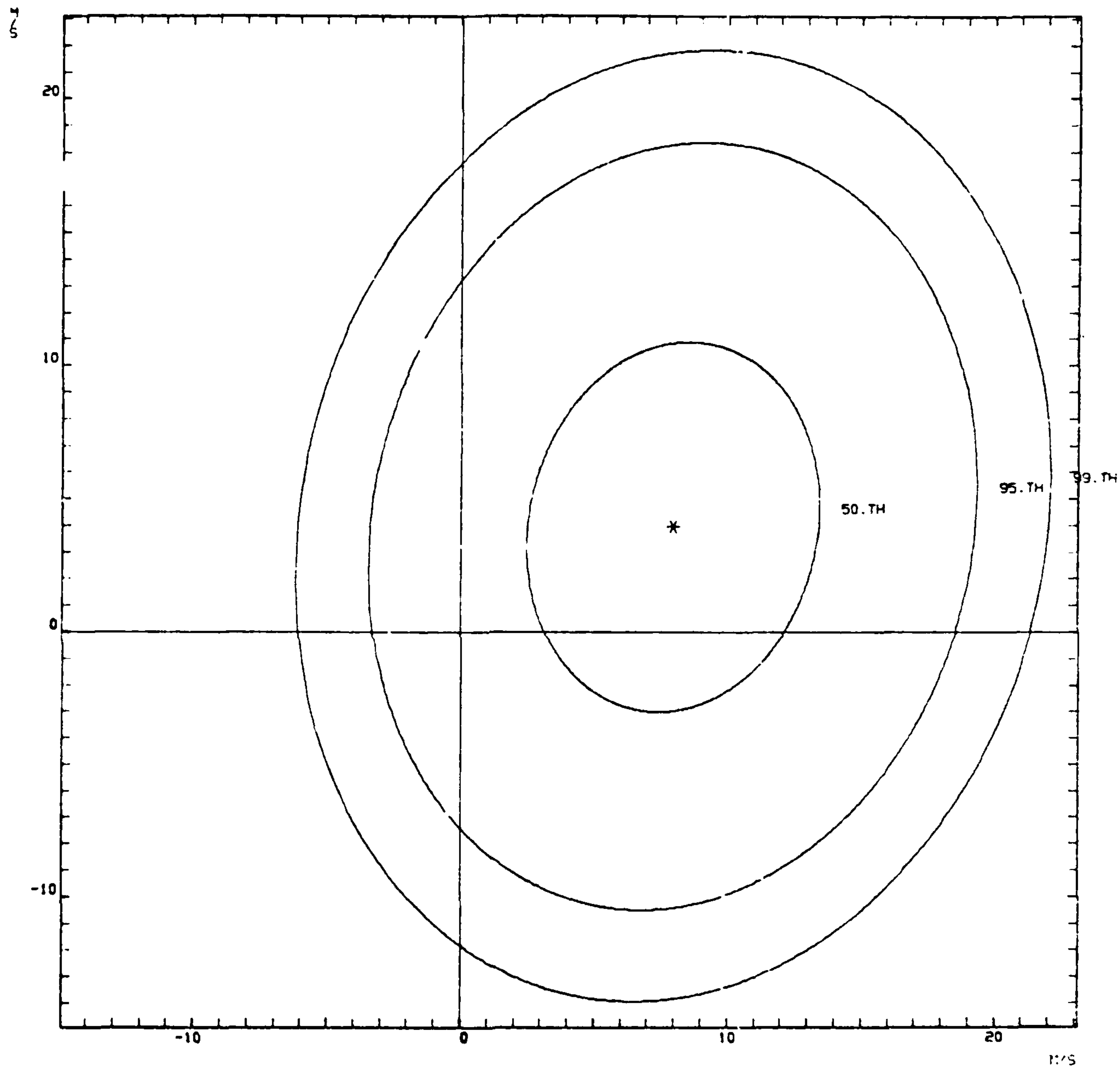


Fig. A-50

STATION=DUGWAY MONTH=JUL A_T= 20KM

WIND PROBABILITY ELLIPSES

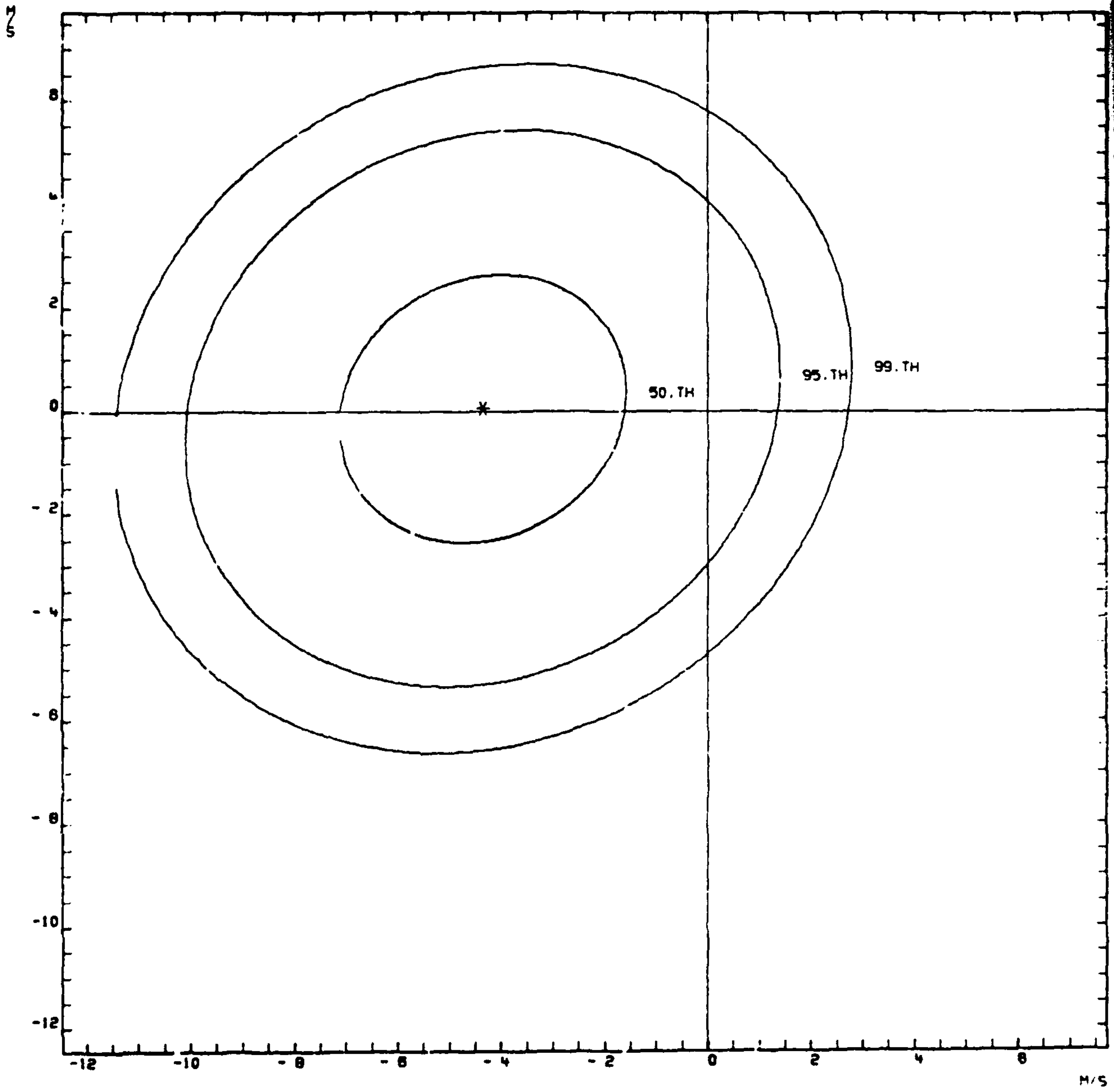


Fig. A-51

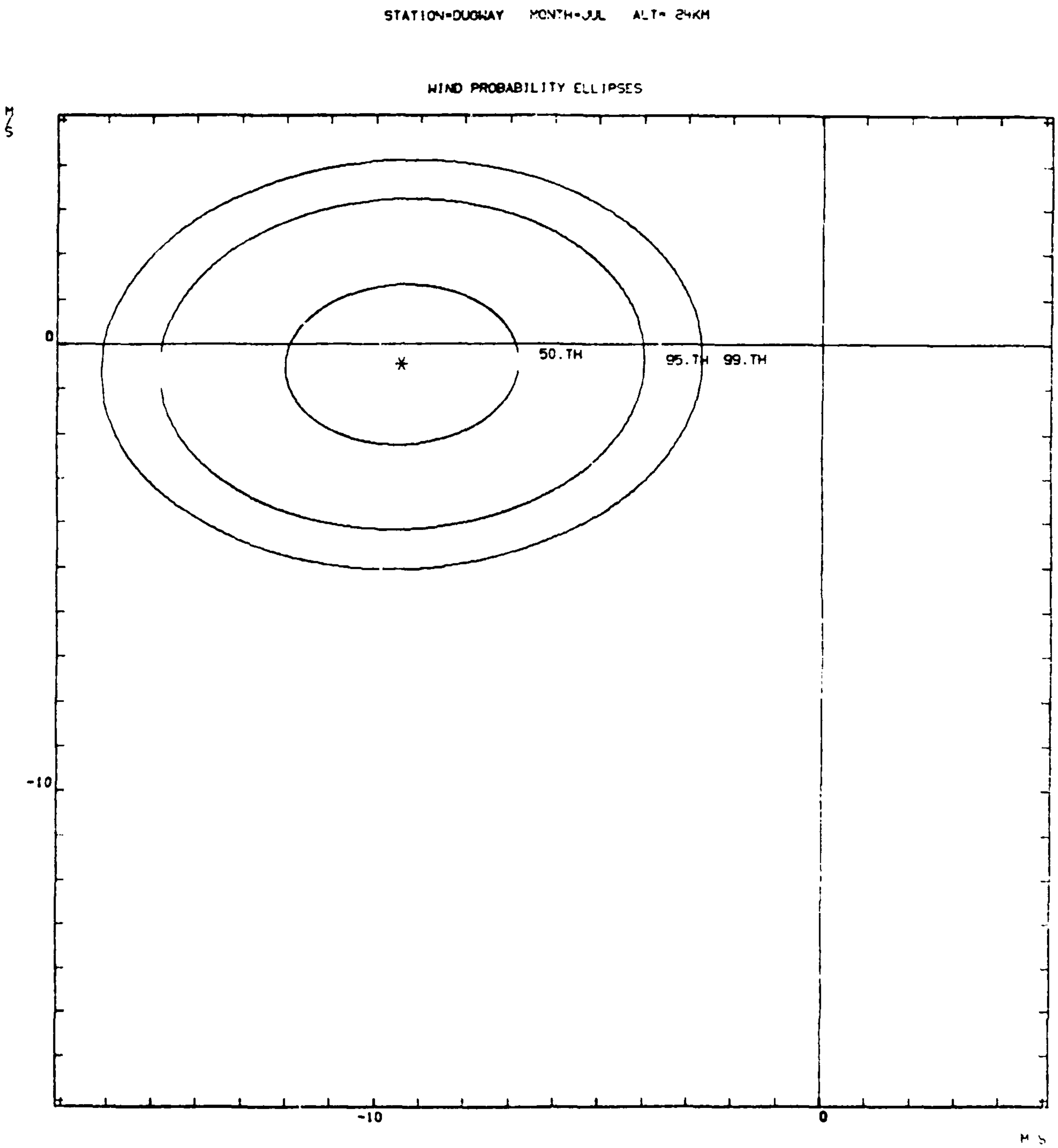

STATION=DUGWAY MONTH=JUL ALT= 24KM
WIND PROBABILITY ELLIPSES
M/S
0
-10
50.TH
95.TH
99.TH
-10
0
M/S

Fig. A-52

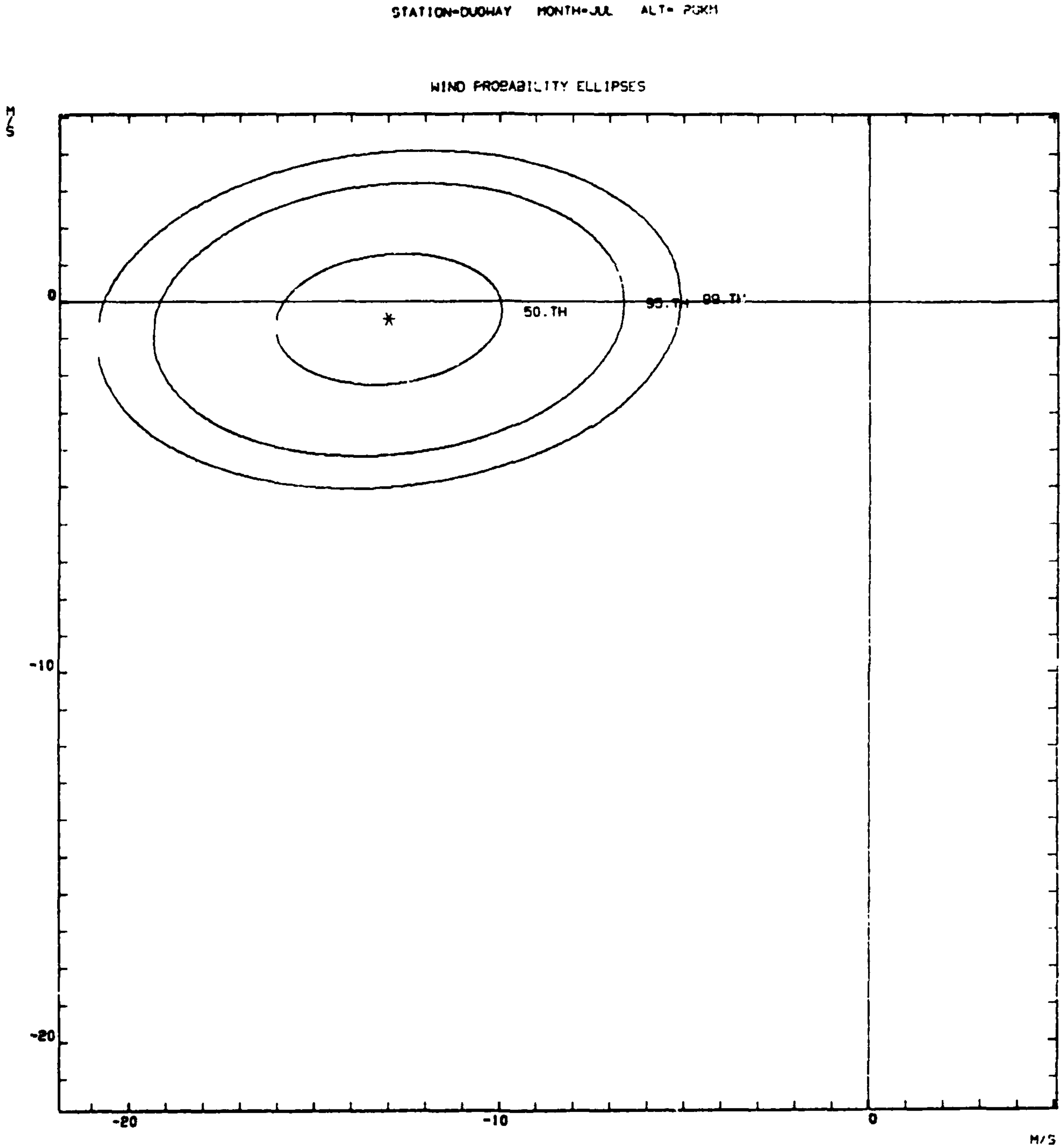

STATION=DUGWAY MONTH=JUL ALT= 20KM
WIND PROBABILITY ELLIPSES
M/S
0
-10
-20
50.TH
-20
-10
0
M/S

Fig. A-53

STATION=DUGWAY MONTH=JUL ALT= 30KM

WIND PROBABILITY ELLIPSES

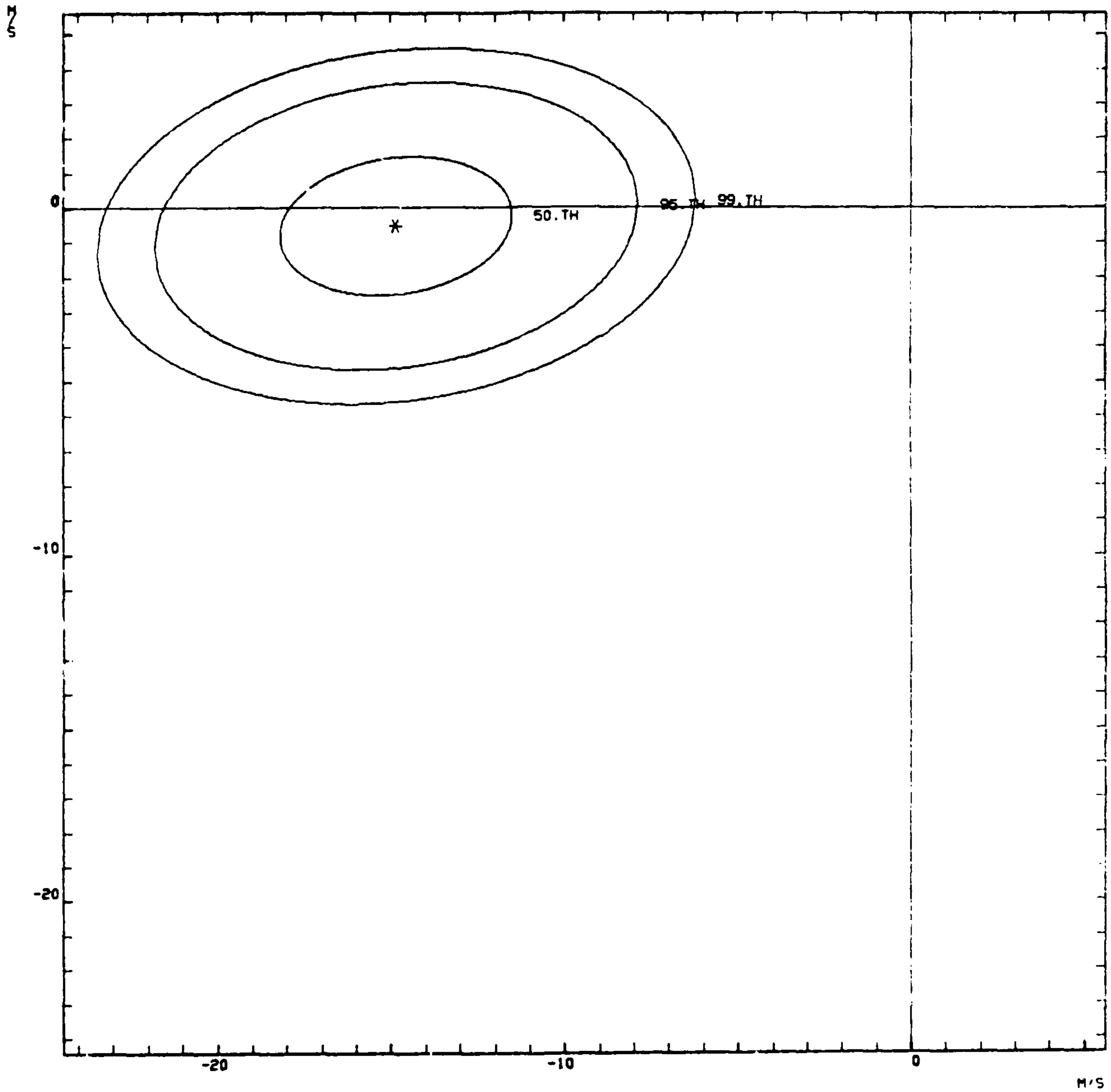


Fig. A-54

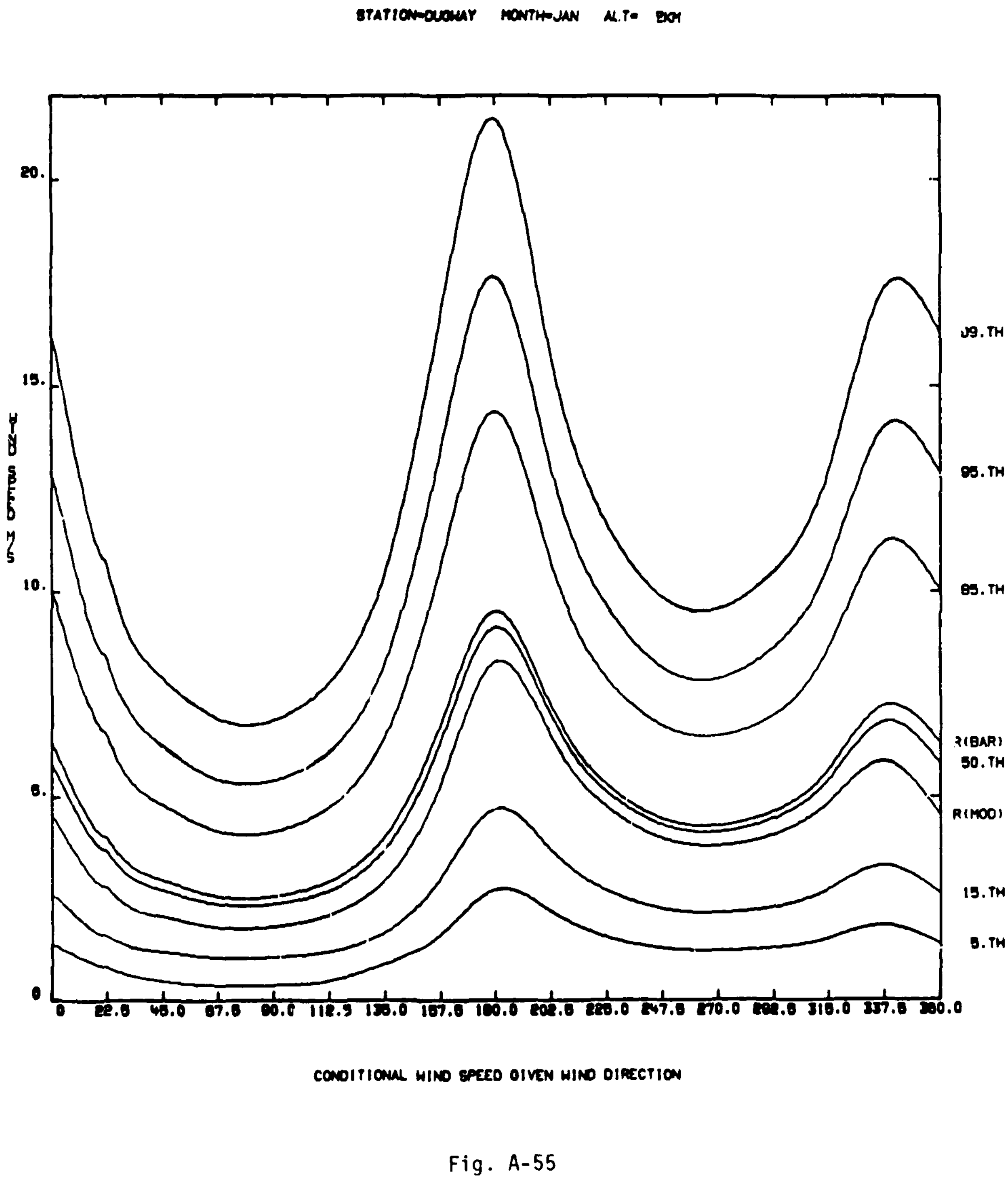
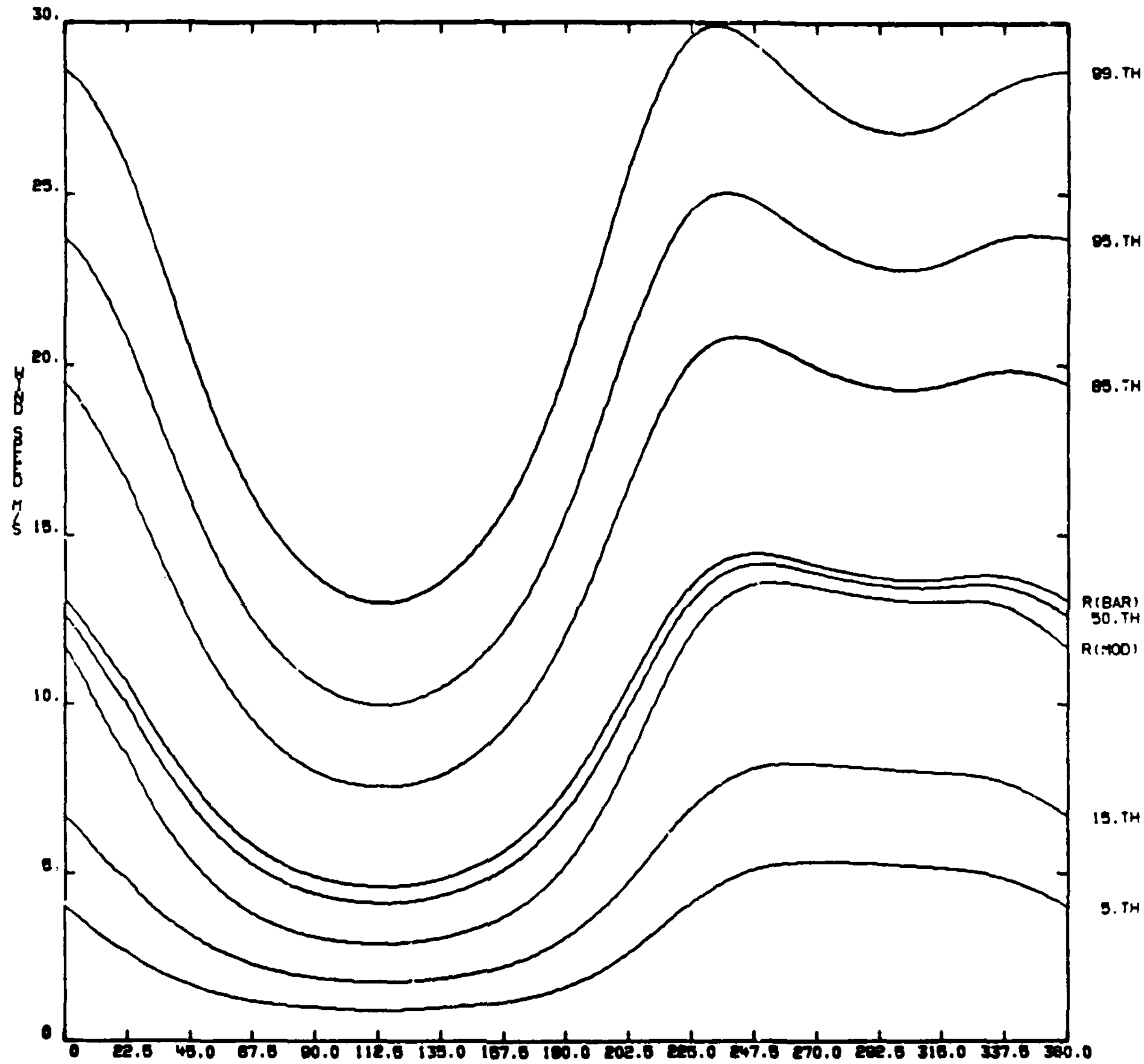

STATION=DUGWAY MONTH=JAN ALT= 9KM
20.
15.
10.
5.
0
WIND SPEED M/S
99.TH
95.TH
85.TH
R(BAR)
50.TH
R(MOD)
15.TH
5.TH
0 22.5 45.0 67.5 90.0 112.5 135.0 157.5 180.0 202.5 225.0 247.5 270.0 292.5 315.0 337.5 360.0
CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Fig. A-55

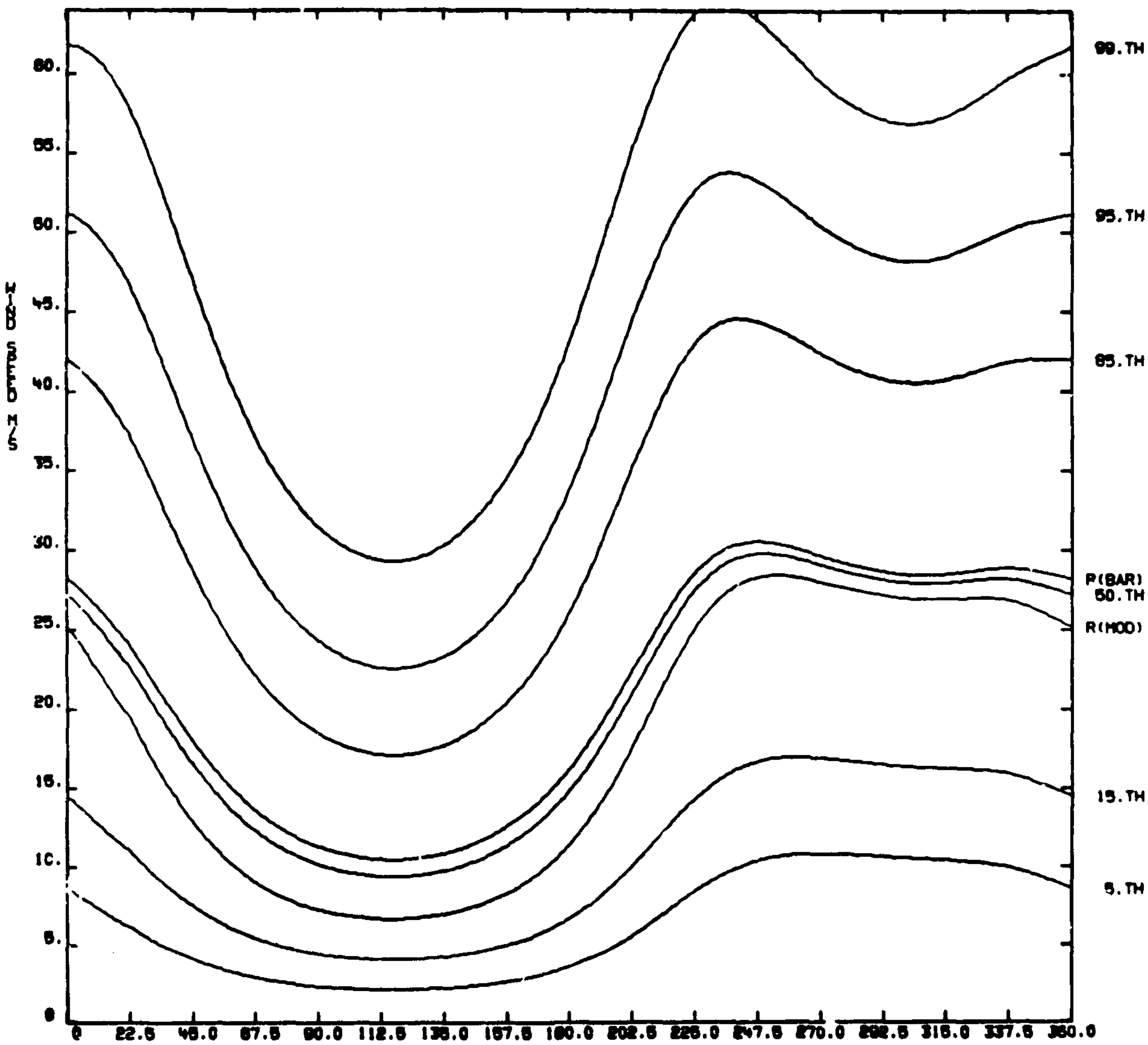
STATION=DUGWAY MONTH=JAN ALT= 4KM



CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Fig. A-56

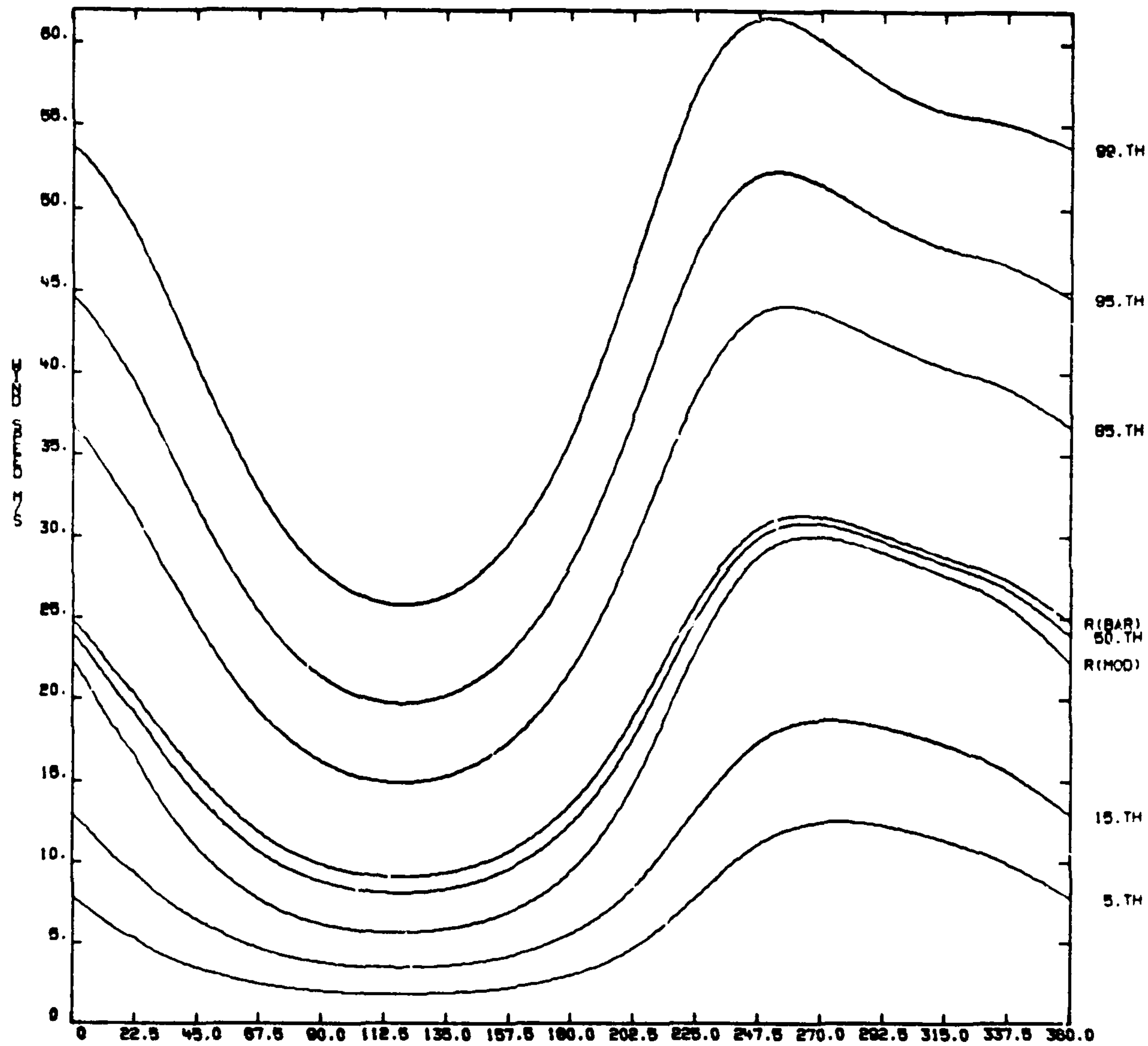
STATION=DUGWAY MONTH=JAN ALT= 8KM



CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Fig. A-57

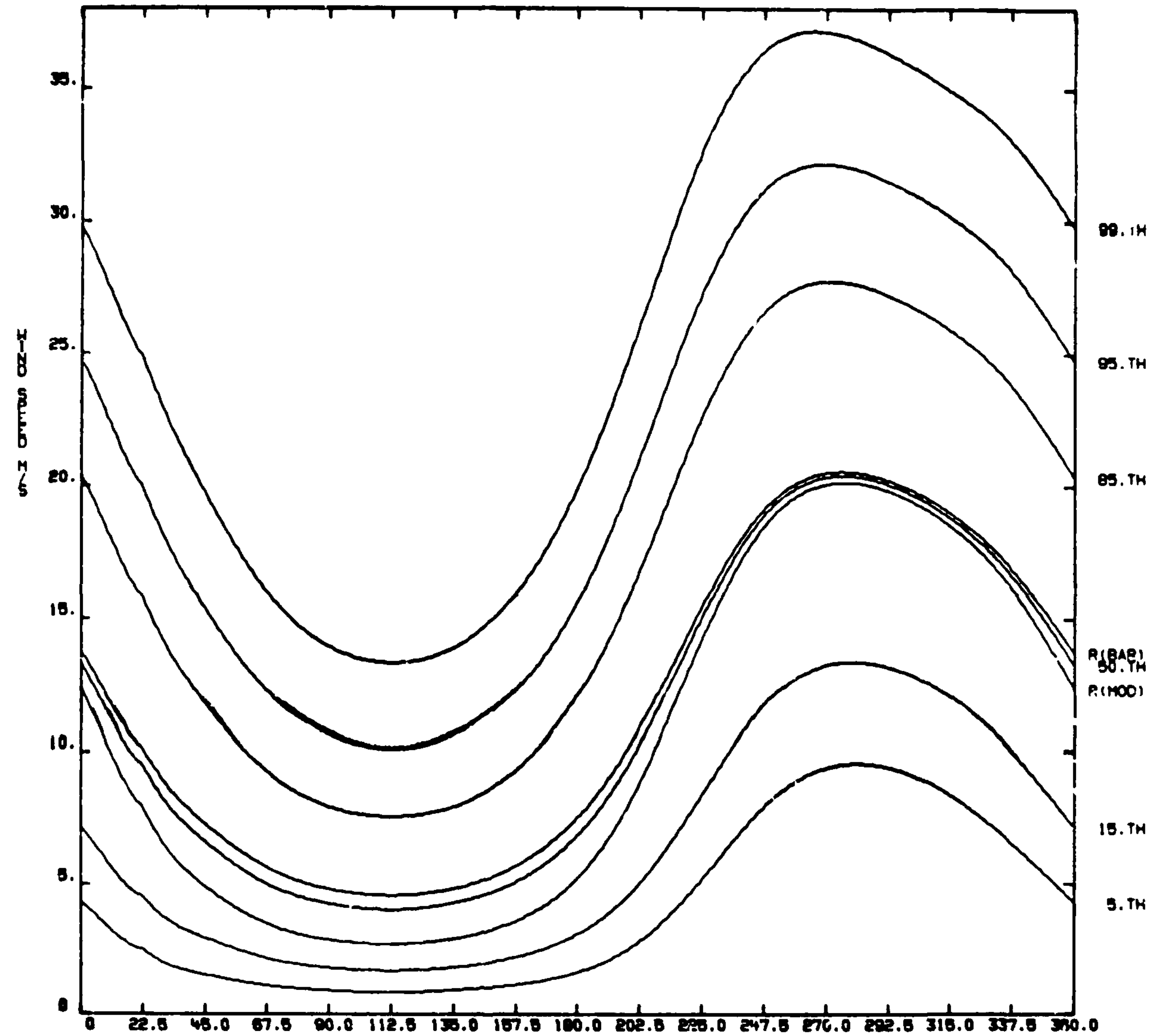
STATION=DUGWAY MONTH=JAN ALT= 12KM



CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Fig. A-58

STATION=DUGWAY MONTH=JAN ALT= 16KM



CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Fig. A-59

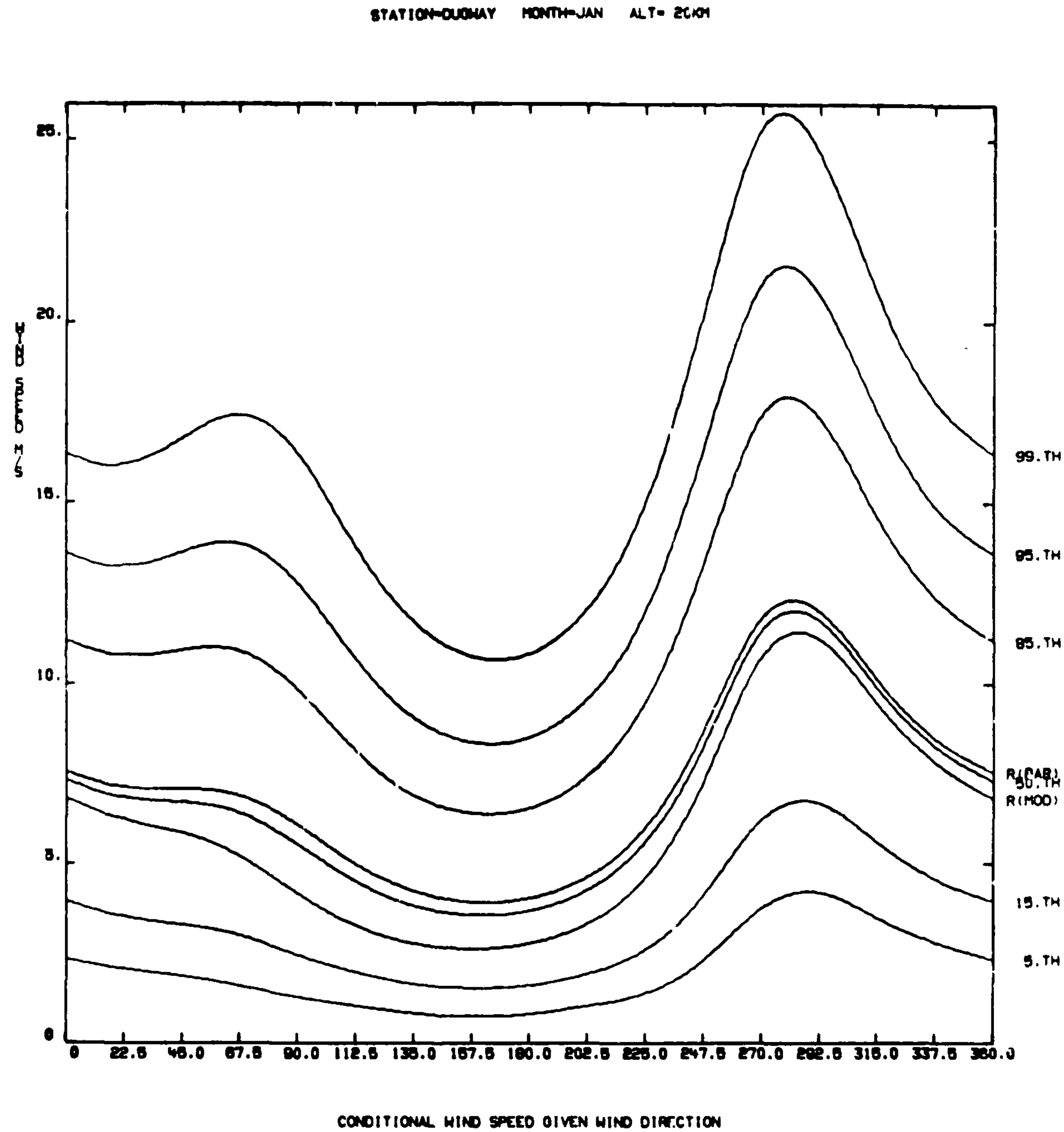
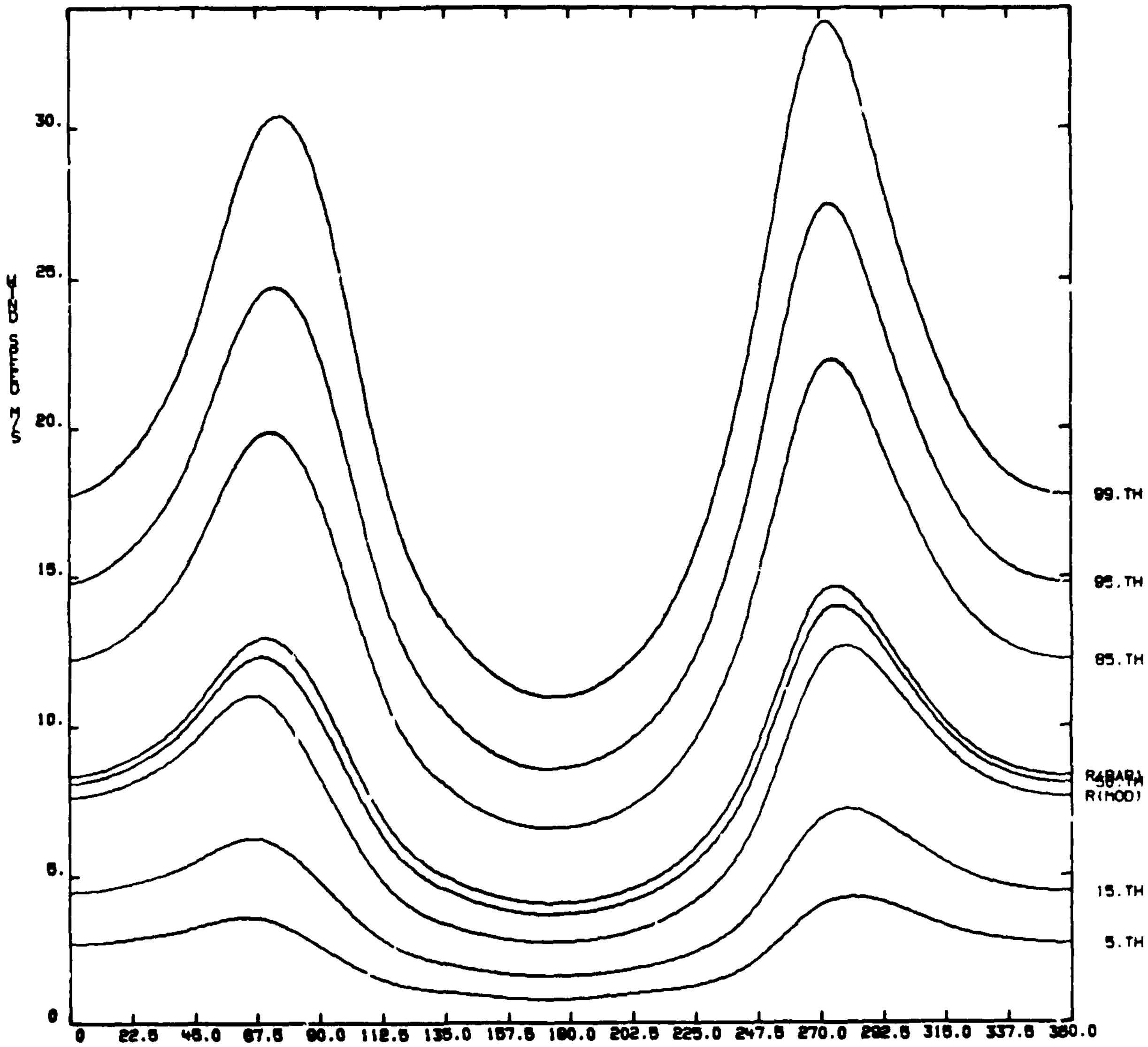

STATION=DUGWAY MONTH=JAN ALT= 20KM
WIND SPEED M/S
25.
20.
15.
10.
5.
0
0 22.5 45.0 67.5 90.0 112.5 135.0 157.5 180.0 202.5 225.0 247.5 270.0 292.5 315.0 337.5 360.0
99.TH
95.TH
85.TH
R(RAB)
50.TH
R(MOD)
15.TH
5.TH
CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Fig. A-60

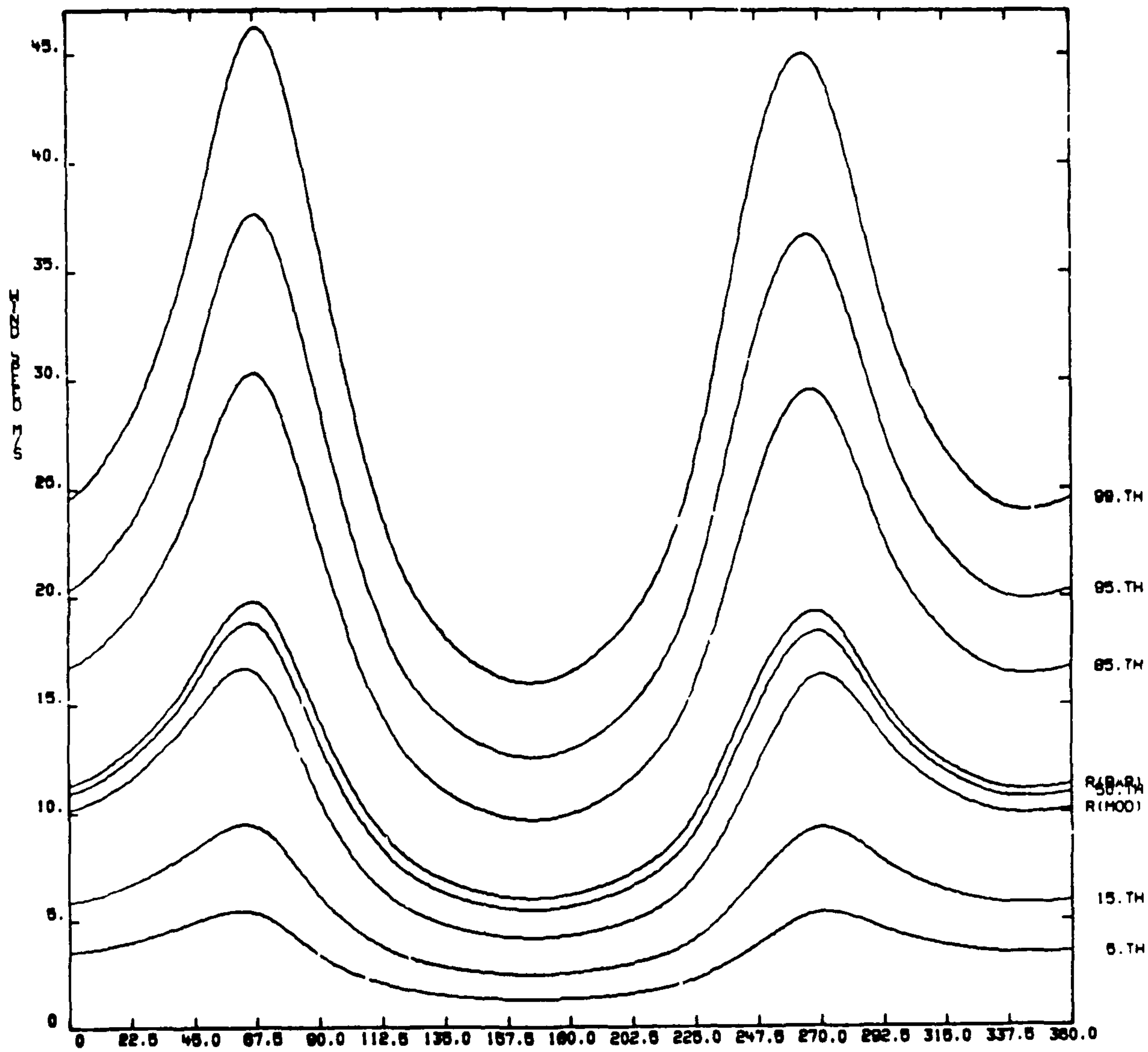
STATION=DUGWAY MONTH=JAN ALT= 2401



CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Fig. A-61

STATION=DUGWAY MONTH=JAN ALT= 28KM



CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Fig. A-62

STATION=DUGWAY MONTH=JAN ALT= 30KM

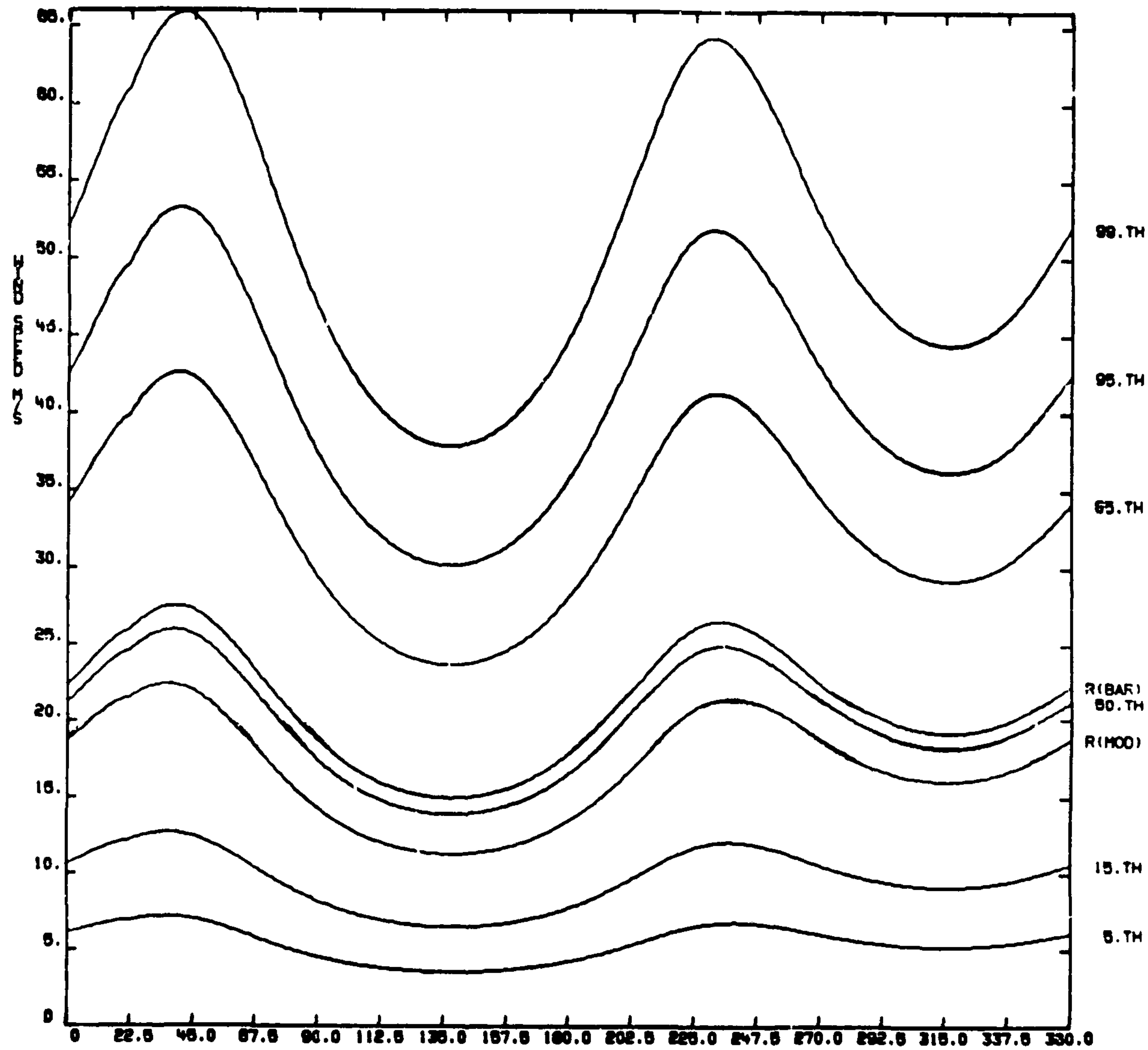
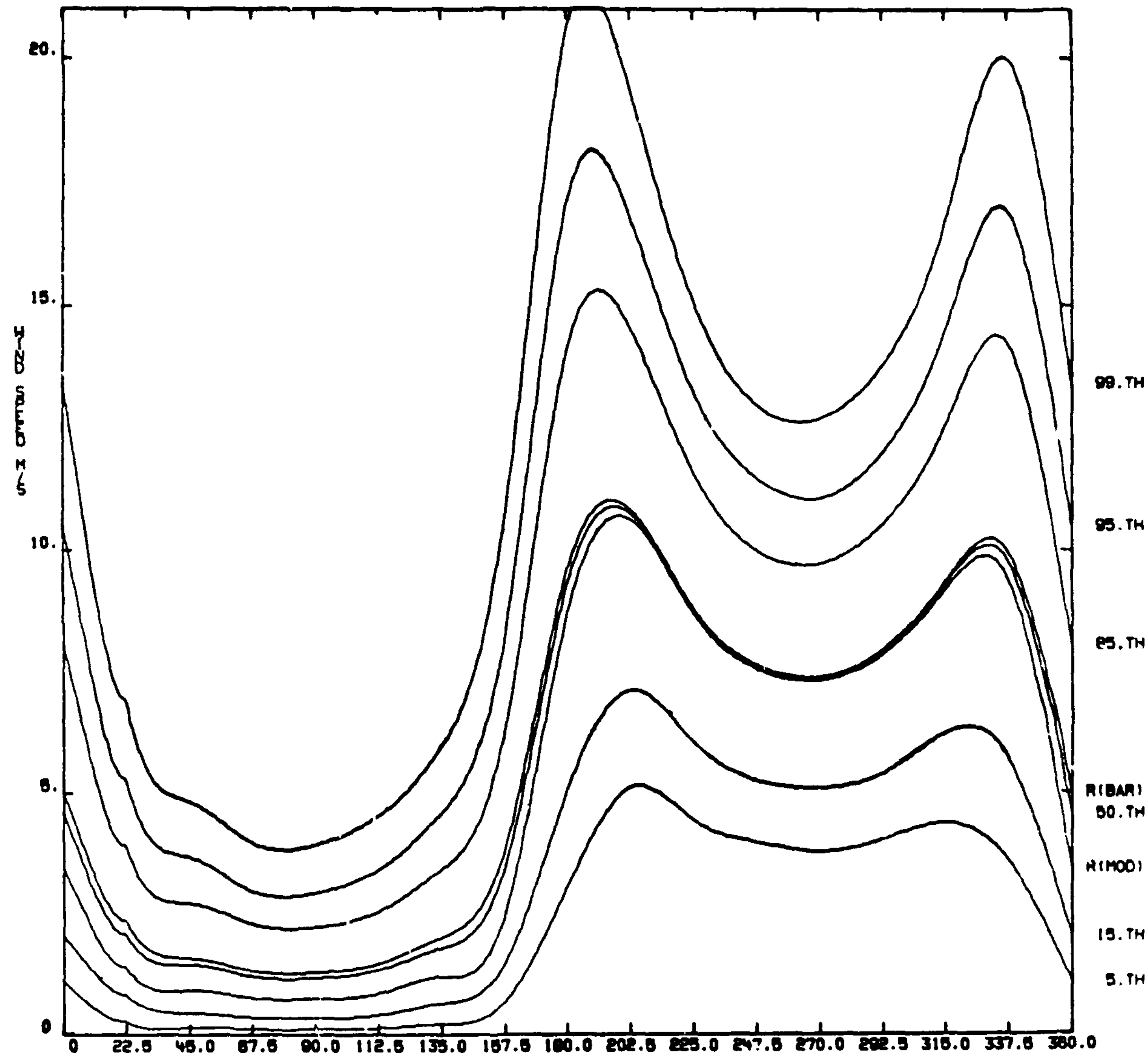


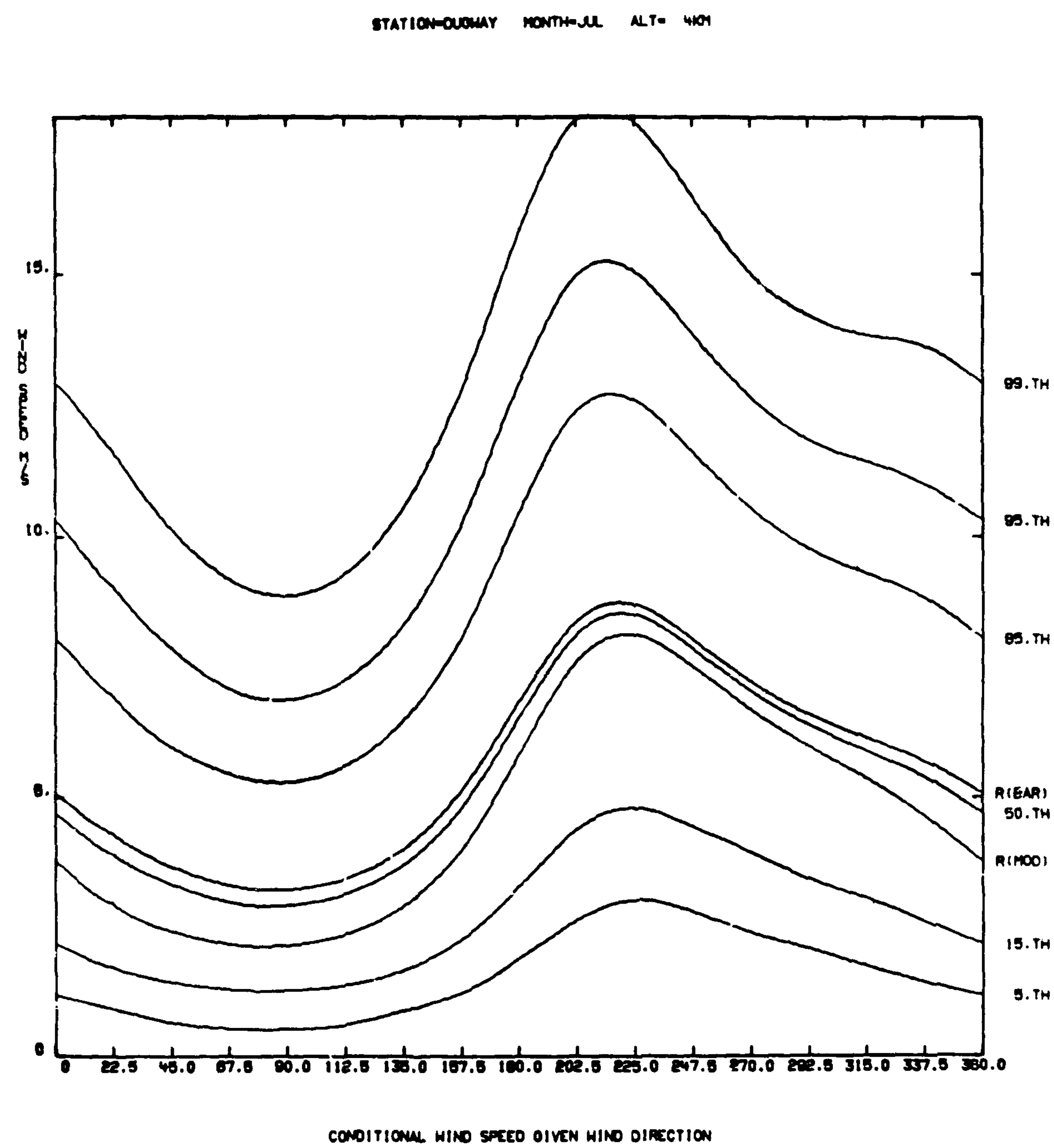
Fig. A-63

STATION=DUGWAY MONTH=JUL ALT= 2KM



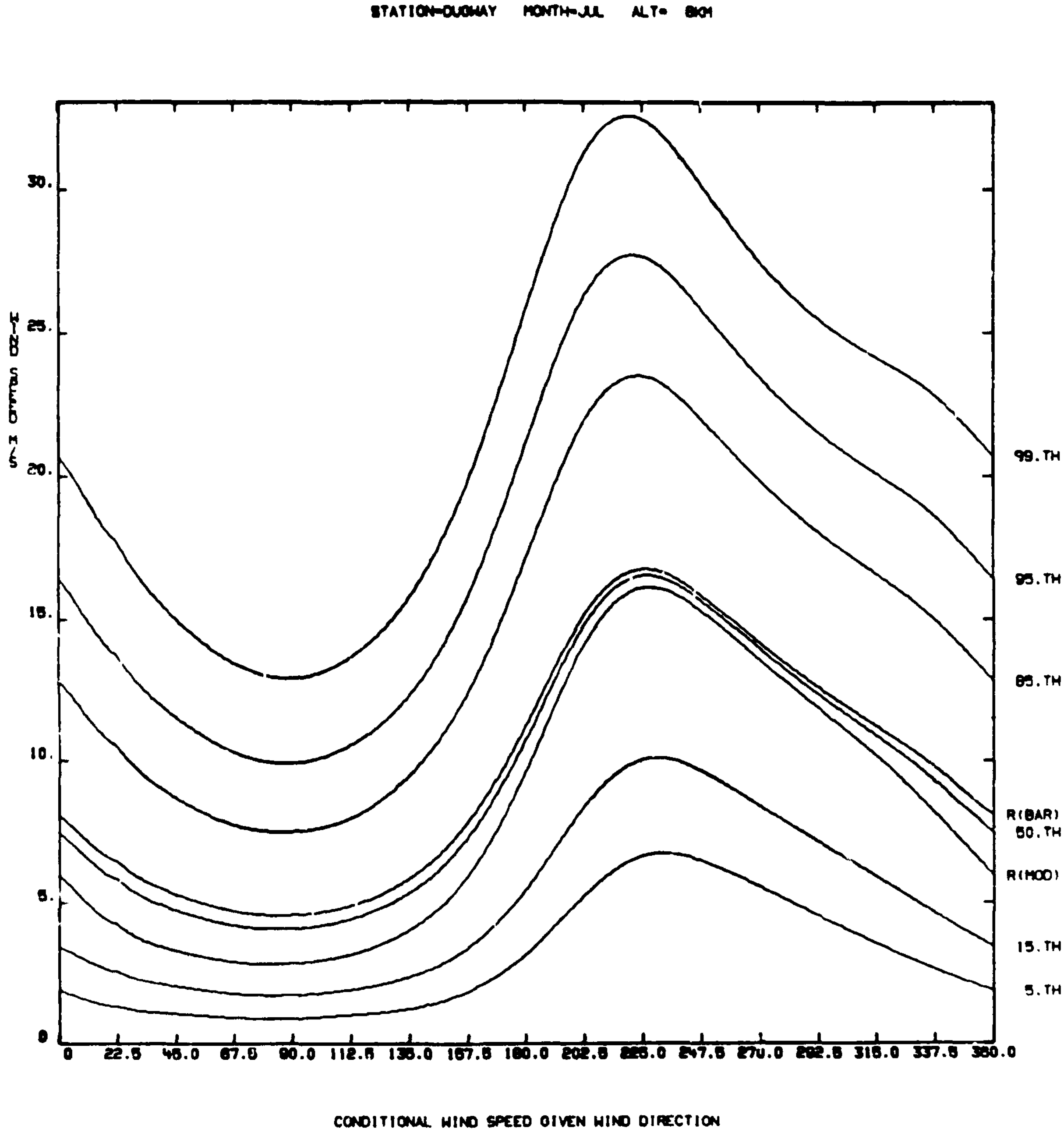
CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Fig. A-64



STATION=DUGWAY MONTH=JUL ALT= 4KM
WIND SPEED M/S
15.
10.
5.
0
99.TH
95.TH
85.TH
R(EAR)
50.TH
R(MOD)
15.TH
5.TH
0 22.5 45.0 67.5 90.0 112.5 135.0 157.5 180.0 202.5 225.0 247.5 270.0 292.5 315.0 337.5 360.0
CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

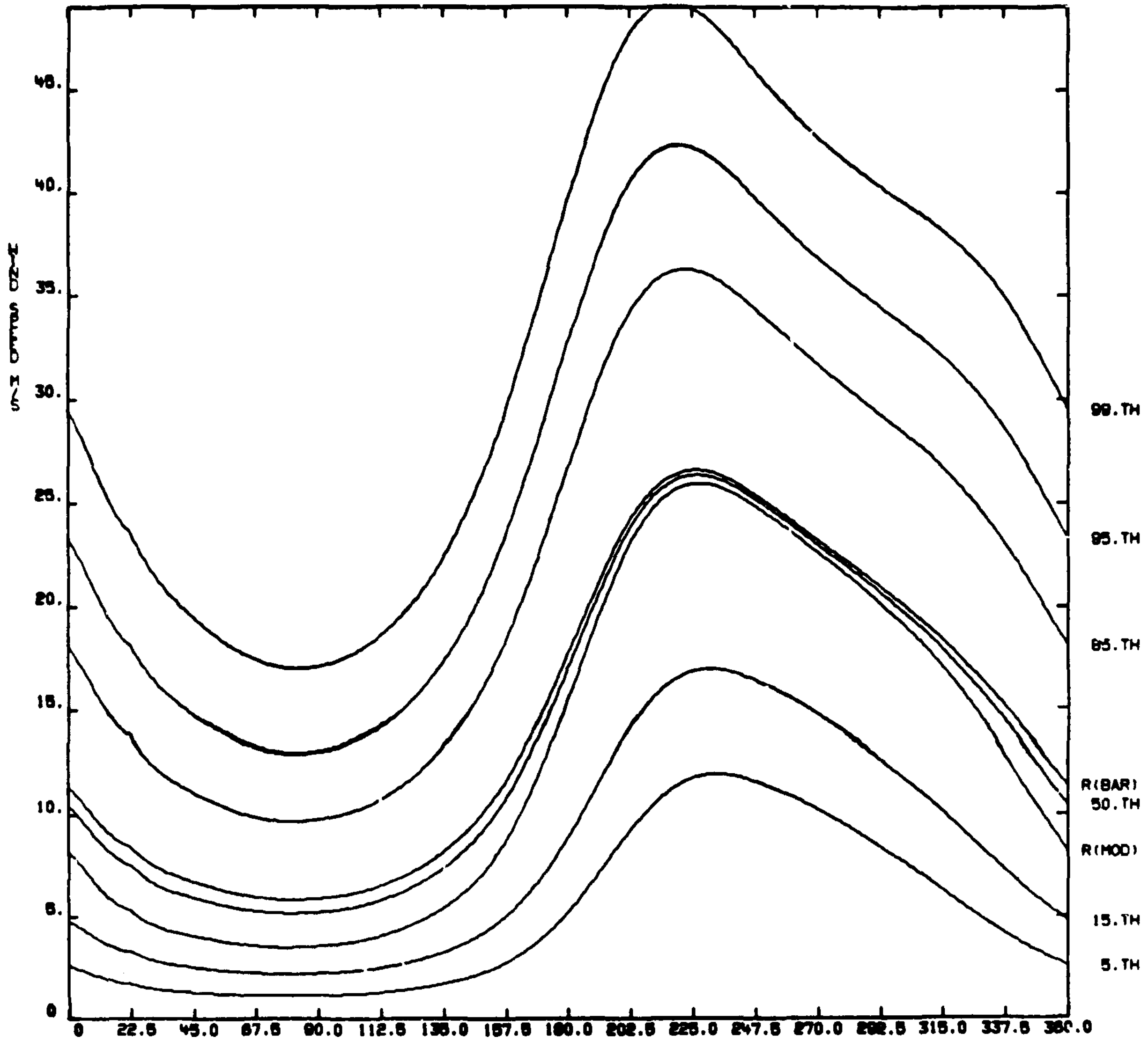
Fig. A-65



STATION=DUGWAY MONTH=JUL ALT= 8KM
WIND SPEED M/S
30.
25.
20.
15.
10.
5.
0
0 22.5 45.0 67.5 90.0 112.5 135.0 157.5 180.0 202.5 225.0 247.5 270.0 292.5 315.0 337.5 360.0
99.TH
95.TH
85.TH
R(BAR)
50.TH
R(MOD)
15.TH
5.TH
CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Fig. A-66

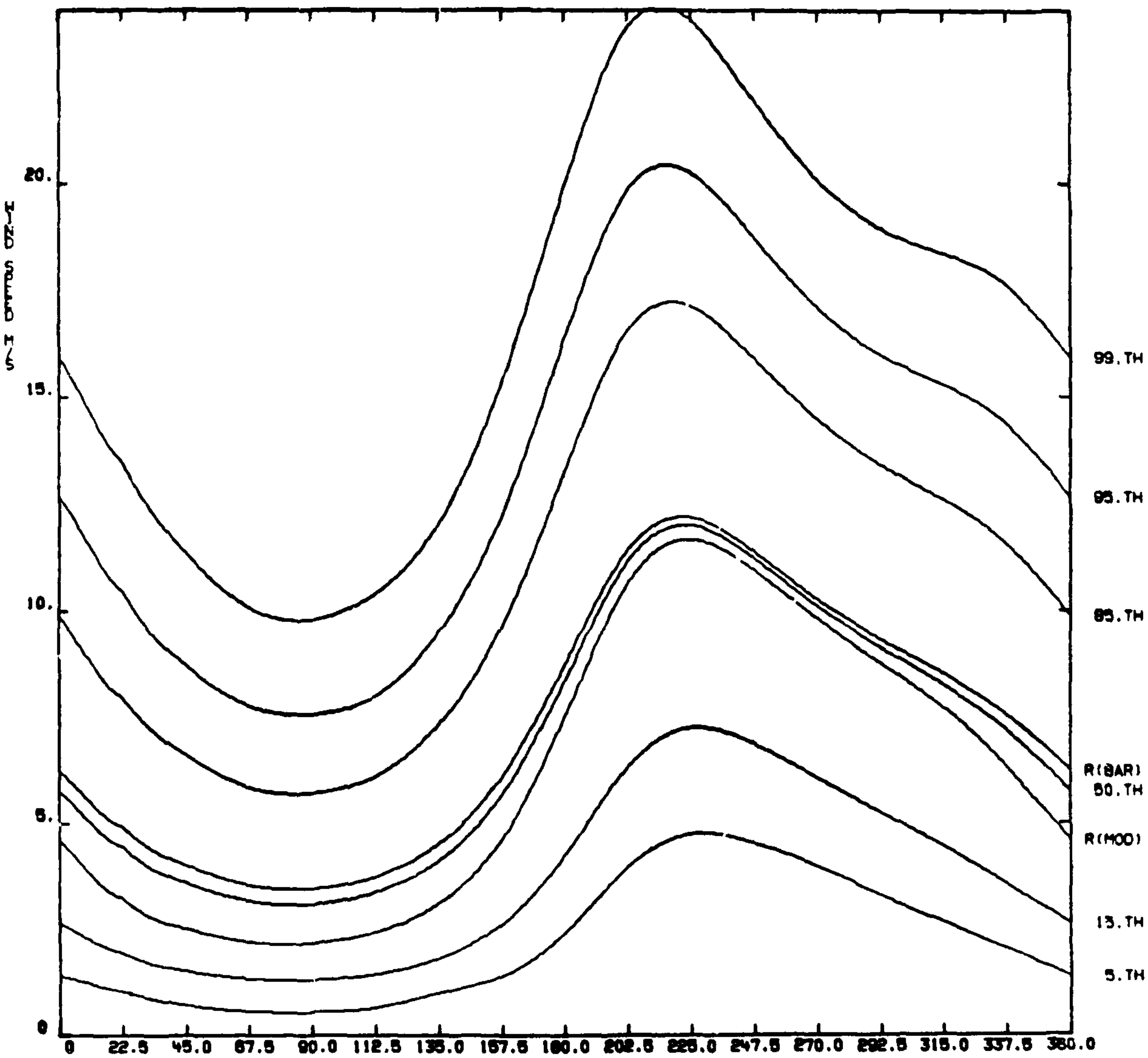
STATION=DUGWAY MONTH=JUL ALT= 12KM



CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Fig. A-67

STATION=DUGWAY MONTH=JUL ALT= 15KM



CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Fig. A-68

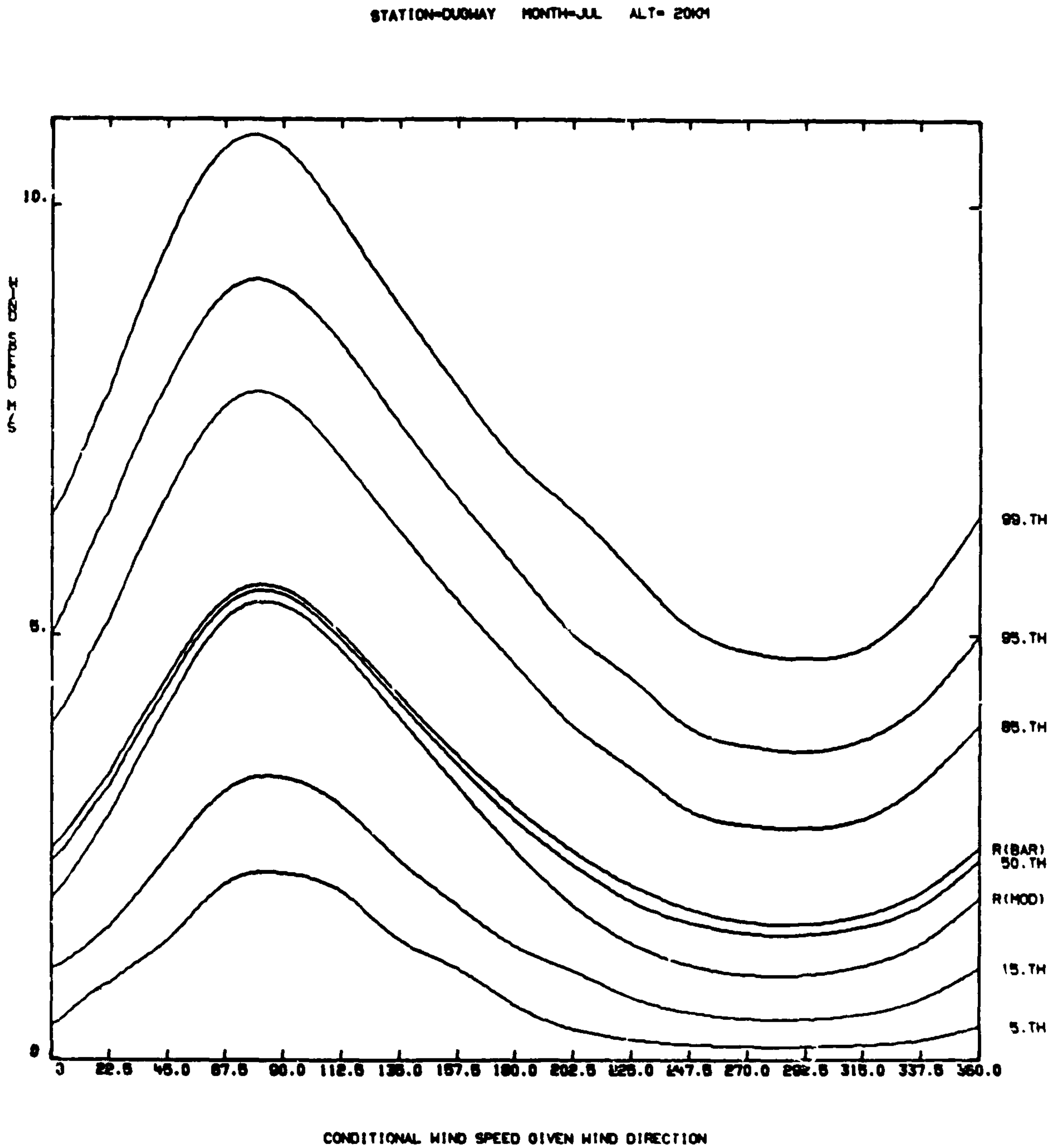
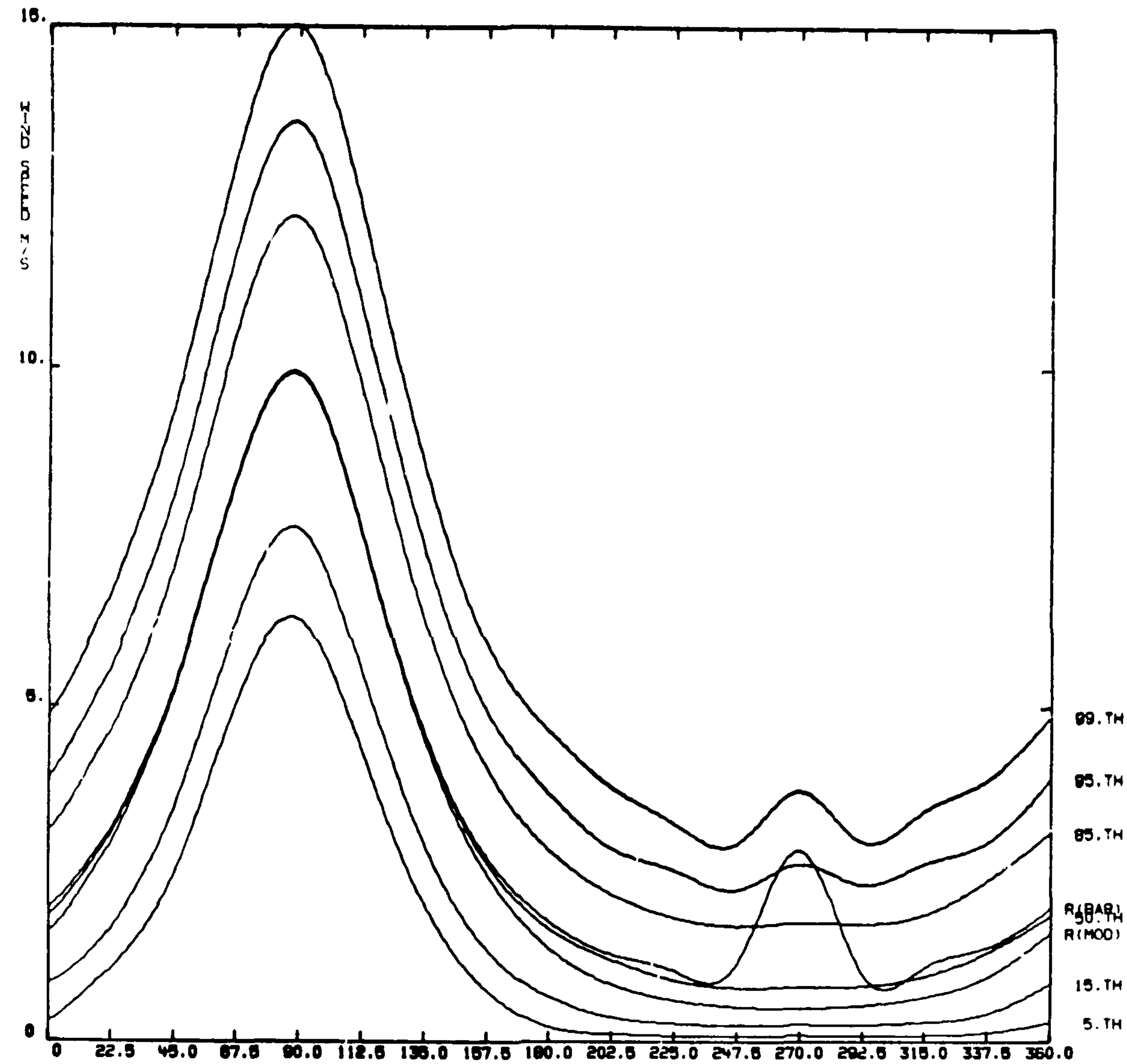

STATION=DUGWAY MONTH=JUL ALT= 20KM
WIND SPEED M/S
10.
5.
0
0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
360.0
99.TH
95.TH
85.TH
R(BAR)
50.TH
R(MOD)
15.TH
5.TH
CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Fig. A-69

STATION=DUGWAY MONTH=JUL ALT= 24KM



CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Fig. A-70

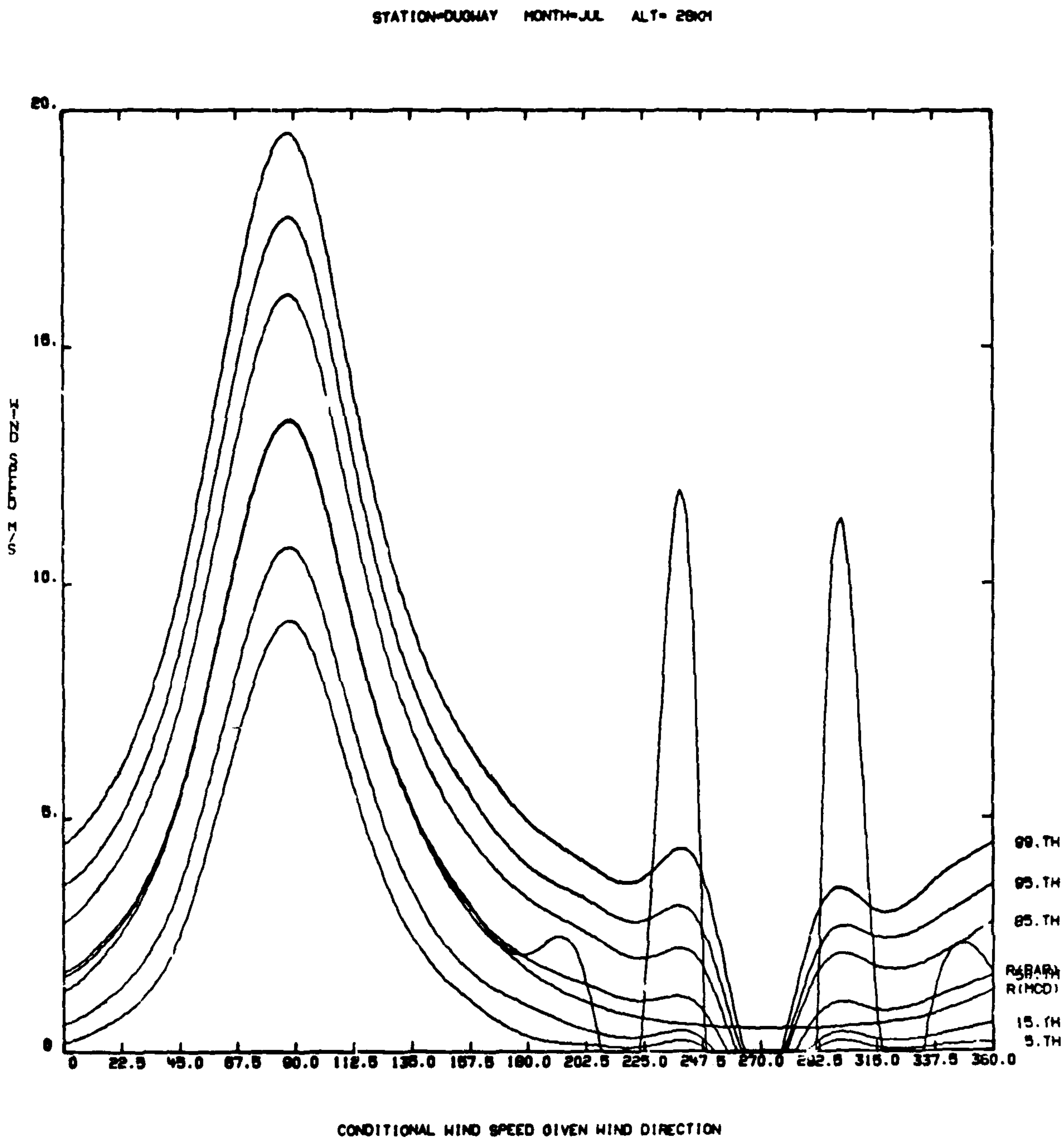

STATION=DUGWAY MONTH=JUL ALT= 28KM
20.
15.
10.
5.
0
WIND SPEED M/S
0 22.5 45.0 67.5 90.0 112.5 135.0 157.5 180.0 202.5 225.0 247.5 270.0 292.5 315.0 337.5 360.0
99.TH
95.TH
85.TH
R(BAR)
50.TH
R(MCD)
15.TH
5.TH
CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Fig. A-71

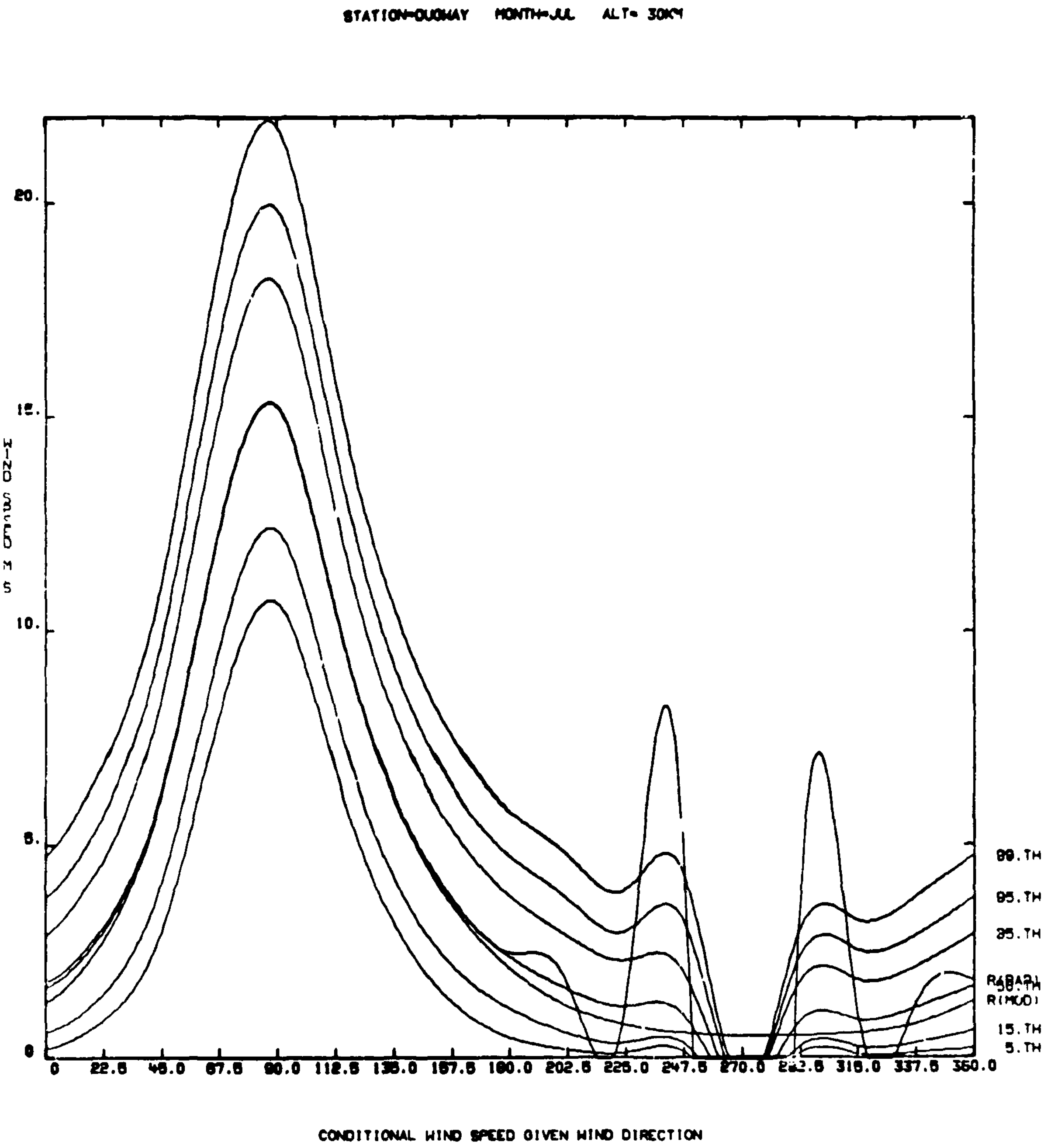

STATION=DUGWAY MONTH=JUL ALT= 30KM
20.
15.
10.
5.
0
0 22.5 45.0 67.5 90.0 112.5 135.0 157.5 180.0 202.5 225.0 247.5 270.0 292.5 315.0 337.5 360.0
99.TH
95.TH
85.TH
R(BAR)
50.TH
R(MOD)
15.TH
5.TH
CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Fig. A-72

APPENDIX B

RANGE SPECIFIC INFORMATION AND THERMODYNAMIC QUANTITIES FOR DUGWAY, UTAH
(Data base is from Salt Lake City, Utah)

1. Range Specific Information

To prevent further character size reduction for tables I through IV, certain range-specific information has been omitted. This important information is given in table B-1.

TABLE B-1

Header Record 0-30 Km

Table Number	0
Data Source (1 = DATSAV, 2 = WDC-A	1
Call Letters	SLC
WMO Number	725720
Latitude	40.46
Direction (N or S)	N
Longitude	111.58
Direction (E or W)	W
Elevation in Meters	1288
Start Period of Record (Mo-Yr)	160
End Period of Record (Mo-Yr)	1279
No. of Time Windows (0, 1, or 2)	0
Start Time Window #1 (Hr-MNZ)	0
End Time Window #1	0
Start Time Window #2	0
End Time Window #2	0
Date of RRA	980
Altitude Range of RRA Low Level (Km)	0
Altitude Range of RRA High Level (Km)	30
Standard Deviation of Thermodynamic Limits	6.0
Wind Limits	6.0

2. Thermodynamic Quantities

This section presents examples of further computations and graphical displays of pressure, density, and virtual temperature statistics that can be derived from data given in tables II, III, and IV. No attempt is made to present complete nor exhaustive illustrations that can be made to aid in visualizing the relationships that can be made from the data in tables II and IV. The choices are those that aided the committee to verify the reasonableness of the tabulations.

2.1 Monthly Means from the Annual Mean

The hydrostatic model values in table IV are used to compute (1) the monthly mean differences relative to the annual mean values of pressure,

density, and virtual temperature expressed in percent and (2) the monthly mean difference in virtual temperature for the annual mean virtual temperature expressed in degrees Kelvin. Examples of these four statistics are given in table B-2 for January and table B-3 for July. Graphical displays of the four statistics contained in tables B-2 and B-3 are shown in figures B-1 through B-8. Also, the relative differences between the monthly mean values from table IV-1 through IV-12 for all months from the annual mean values (table IV-13) are illustrated in figure B-9 for pressure, in figure B-10 for density, and in figure B-11 for virtual temperature. The monthly mean virtual temperature differences from the annual mean virtual temperature for all months are given in figure B-12. The simple sum of the monthly mean differences from the annual mean values of these quantities is not zero. This is because the annual mean statistical parameters are computed (see section III. C.3) by weighting the monthly means by the number of observations in each month.

2.2 Coefficients of Variation and Derived Correlation Coefficients

The coefficient of variation, C_V, is defined by the standard deviation with respect to the mean divided by the mean. The coefficients of variation for pressure, C_VP, and density, C_VD, were computed using the standard deviations from table II and the hydrostatic mean values from table IV. The coefficient of variation for temperature uses the standard deviations of virtual temperature from table III to the altitude where virtual temperature exists. Above this altitude, the standard deviations of temperature are from table II. The mean values for temperature (virtual temperature to the altitude where it exists) are taken from table IV. No distinction is made in the table headings in table B-4 (Jan) and table B-5 (July) and all related figures between virtual temperature and temperature.

From the coefficients of variation for pressure, density, and temperature (virtual temperature to the altitude where it exists), the correlation coefficients between these quantities are derived using Buell's method (see reference in text). The equations for these derived correlation coefficients are

$$r(P,T) = \frac{(C_VT)^2 + (C_VP)^2 - (C_VD)^2}{2[C_VT \cdot C_VP]} \quad . \qquad (B-1)$$

$$r(P,D) = \frac{(C_VD)^2 - (C_VT)^2 + (C_VP)^2}{2[C_VD \cdot C_VP]} \quad . \qquad (B-2)$$

$$r(T,D) = \frac{(C_VP)^2 - (C_VD)^2 - (C_VT)^2}{2[C_VT \cdot C_VD]} \quad . \qquad (B-3)$$

The correlation coefficients in tables B-4 and B-5 are derived from the above equations.

A test for the validity of the derived correlation coefficients is that all three of the following inequalitites be satisfied.

$$\left.\begin{aligned} C_V P - (C_V D + C_V T] &< 0 \\ C_V D - [C_V T + C_V P] &< 0 \\ C_V T - [C_V P + C_V D] &< 0 \end{aligned}\right\} \qquad \text{(B-4)}$$

In these examples (tables B-4 and B-5) the numerical values from equation (B-4) are all negative; hence, the derived correlation test is considered valid. The rare exceptions to this test for several RRAs occur at the extreme highest altitudes, where sample sizes for the statistical sample are small.

The statistical parameters from table B-4 (January) and table B-5 (July) are illustrated in figures B-13 through B-16.

For all months the $C_V P$ values are shown in figure B-17, the $C_V D$ values are shown in figure B-18, and $C_V T$ values are shown in figure B-19. If the abscissa on the figures for the coefficient of variation were multiplied by 100, these figures would show the percentage of the random dispersion of these quantities over the month with respect to the monthly mean for these thermodynamic quantities.

The derived correlation coefficients for all months are illustrated in the following figures:

a) Figure B-20 gives r(P,D).

b) Figure B-21 gives r(P,T).

c) Figure B-22 gives r(T,D).

TABLE B-2

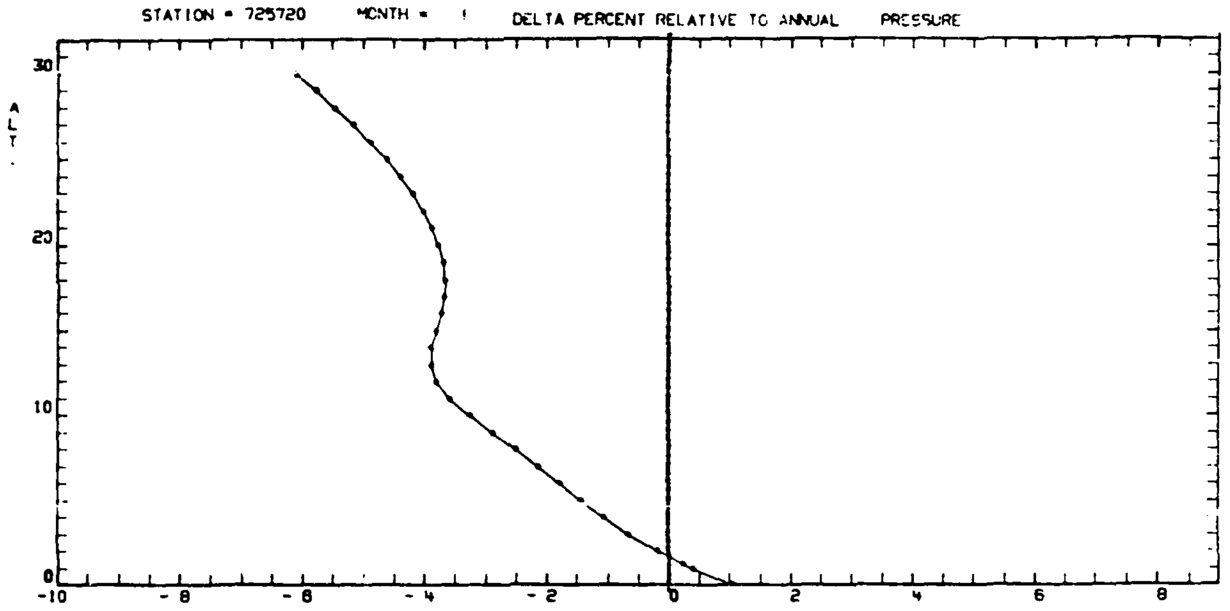
STATION 725720 MONTH 1
DELTAS IN PERCENT RELATIVE TO ANNUAL

LEVEL	PRESSURE	DENSITY	TEMP.	TMO-TANN(DEG.K)
.000	1.05	6.87	-5.61	-16.48
1.000	.40	5.66	-4.92	-14.12
1.288	.22	5.26	-4.76	-13.57
2.000	-.17	4.00	-4.03	-11.35
3.000	-.65	2.89	-3.45	-9.48
4.000	-1.06	1.92	-2.92	-7.82
5.000	-1.42	1.24	-2.63	-6.87
6.000	-1.77	.80	-2.56	-6.50
7.000	-2.12	.51	-2.62	-6.46
8.000	-2.49	.15	-2.64	-6.32
9.000	-2.87	-.27	-2.[illegible]	-6.[illegible]
10.000	-3.24	-.83	-2.42	-5.47
11.000	-3.57	-1.65	-1.95	-4.30
12.000	-3.80	-2.78	-1.07	-2.33
13.000	-3.89	-3.77	-.10	-.22
14.000	-3.87	-4.26	.41	.87
15.000	-3.79	-4.37	.57	1.22
16.000	-3.72	-4.13	.45	.95
17.000	-3.66	-3.90	.22	.46
18.000	-3.65	-3.56	-.03	-.06
19.000	-3.68	-3.36	-.35	-.74
20.000	-3.75	-3.19	-.57	-1.23
21.000	-3.86	-3.06	-.82	-1.77
22.000	-4.00	-2.99	-1.03	-2.24
23.000	-4.17	-2.92	-1.29	-2.80
24.000	-4.38	-2.97	-1.44	-3.16
25.000	-4.61	-3.02	-1.62	-3.56
26.000	-4.86	-3.14	-1.78	-3.93
27.000	-5.14	-3.21	-2.00	-4.45
28.000	-5.44	-3.36	-2.14	-4.78
29.000	-5.76	-3.60	-2.24	-5.05
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE B-3

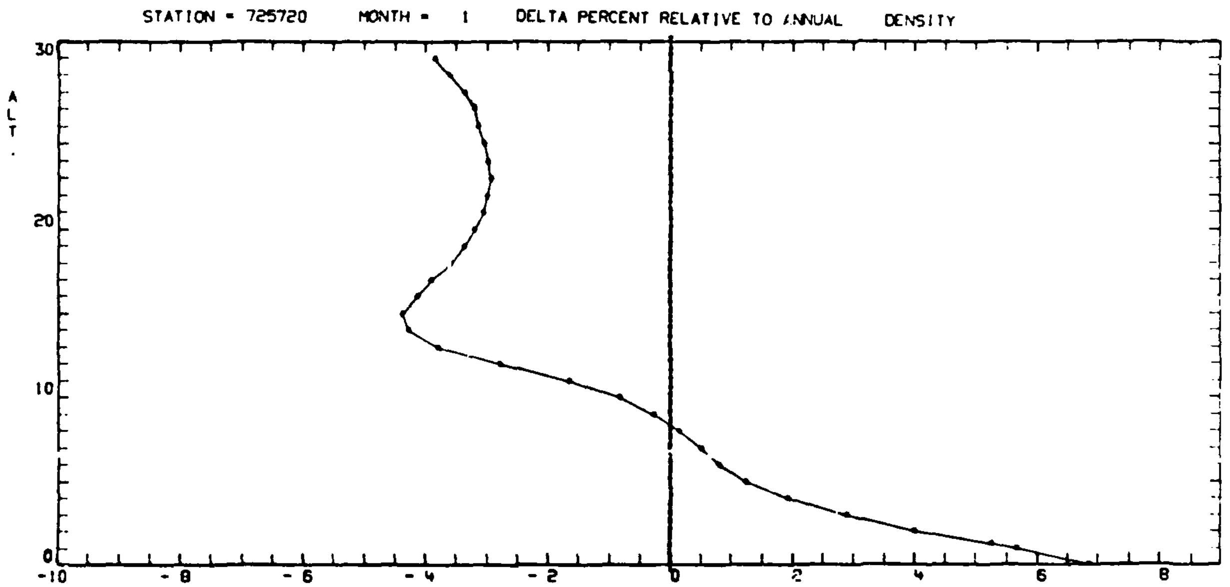
STATION 725720 MONTH 7
DELTAS IN PERCENT RELATIVE TO ANNUAL

LEVEL	PRESSURE	DENSITY	TEMP.	TMO-TANN(DEG.K)
.000	-.81	-6.12	5.49	16.12
1.000	-.21	-5.21	5.27	15.13
1.288	-.04	-4.98	5.22	14.69
2.000	.38	-4.46	5.07	14.30
3.000	.96	-3.69	4.82	13.24
4.000	1.52	-2.71	4.34	11.63
5.000	2.04	-1.77	3.88	10.13
6.000	2.54	-1.20	3.77	9.58
7.000	3.06	-.91	4.01	9.91
8.000	3.63	-.57	4.22	10.11
9.000	4.25	-.06	4.31	10.02
10.000	4.88	.75	4.10	9.[illegible]
11.000	5.44	2.11	3.28	7.23
12.000	5.35	3.96	1.82	3.[illegible]
13.000	6.01	5.91	.12	[illegible]
14.000	5.93	7.22	-1.21	-2.60
15.000	5.65	7.75	-1.95	-4.15
16.000	5.32	7.45	-1.96	-4.15
17.000	5.04	6.45	-1.33	-2.83
18.000	4.88	5.46	-.48	-1.03
19.000	4.87	4.57	.30	.65
20.000	4.96	4.11	.81	1.73
21.000	5.13	3.85	1.22	2.[illegible]
22.000	5.35	3.78	1.51	3.27
23.000	5.61	3.80	1.75	3.81
24.000	5.91	3.89	1.94	4.[illegible]
25.000	6.23	4.05	2.10	4.62
26.000	6.58	4.23	2.25	4.97
27.000	6.95	4.45	2.39	5.3[illegible]
28.000	7.34	4.74	2.52	5.[illegible]
29.000	7.74	5.08	2.52	5.[illegible]
30.000	8.13	5.52	2.48	[illegible]



STATION = 725720 MONTH = 1 DELTA PERCENT RELATIVE TO ANNUAL PRESSURE
ALT.

Fig. B-1



STATION = 725720 MONTH = 1 DELTA PERCENT RELATIVE TO ANNUAL DENSITY
ALT.

Fig. B-2

STATION = 725720 MONTH = 1 DELTA PERCENT RELATIVE TO ANNUAL TEMPERATURE

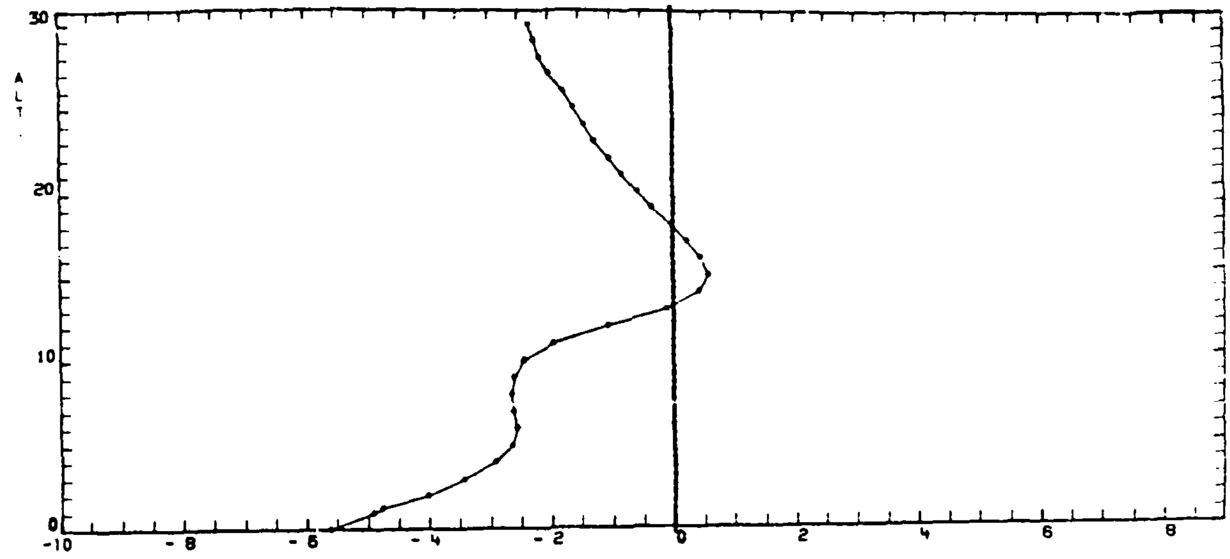


Fig. B-3

STATION = 725720 MONTH = 1 DELTA TEMPERATURE DEG. K

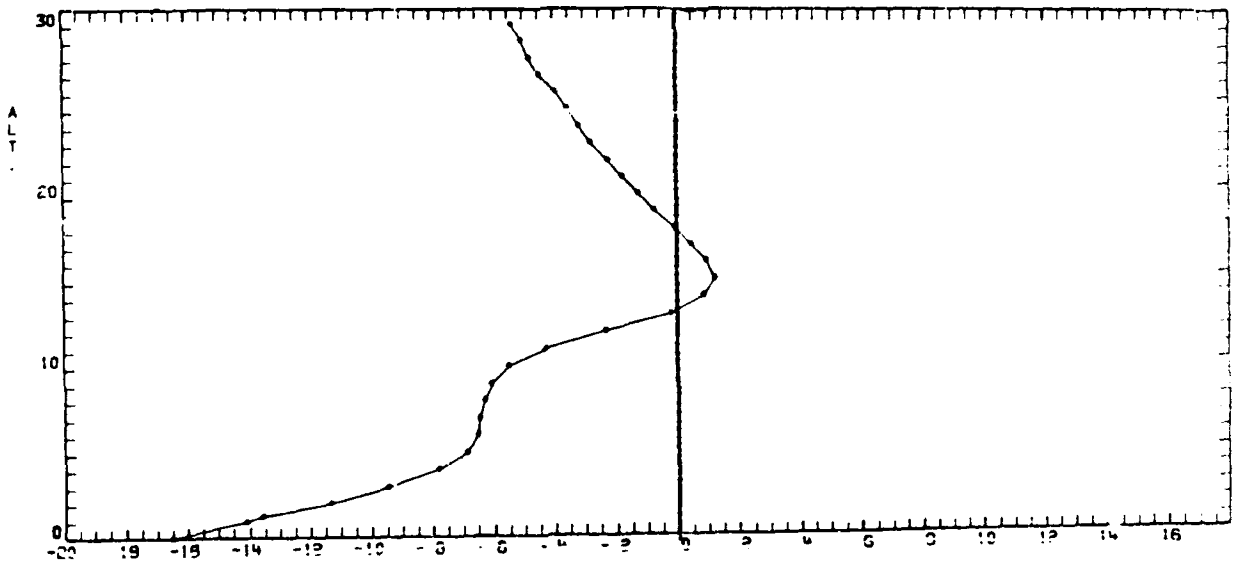


Fig. B-4

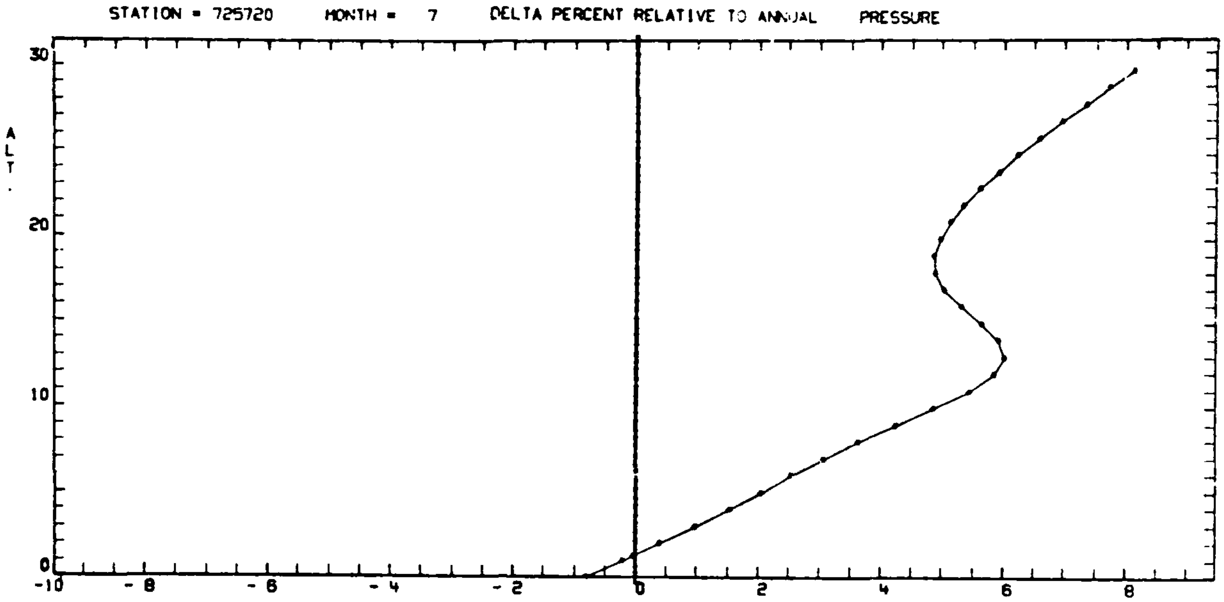

STATION = 725720 MONTH = 7 DELTA PERCENT RELATIVE TO ANNUAL PRESSURE
ALT.
30
20
10
0
-10
-8
-6
-4
-2
0
2
4
6
8

Fig. B-5

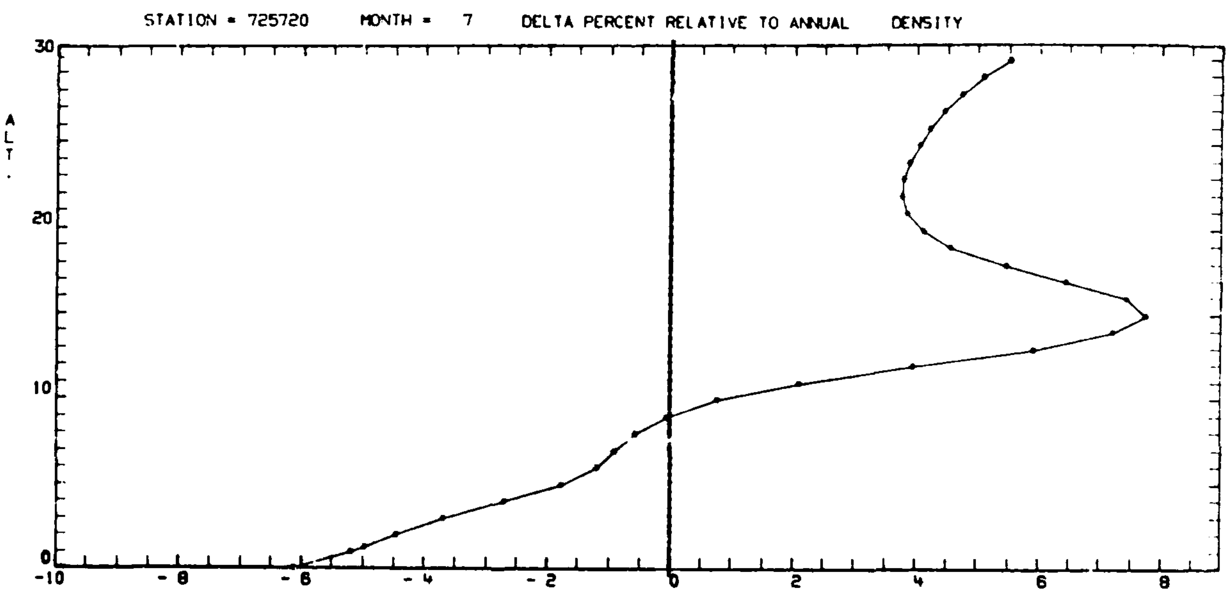

STATION = 725720 MONTH = 7 DELTA PERCENT RELATIVE TO ANNUAL DENSITY
ALT.
30
20
10
0
-10
-8
-6
-4
-2
0
2
4
6
8

Fig. B-6

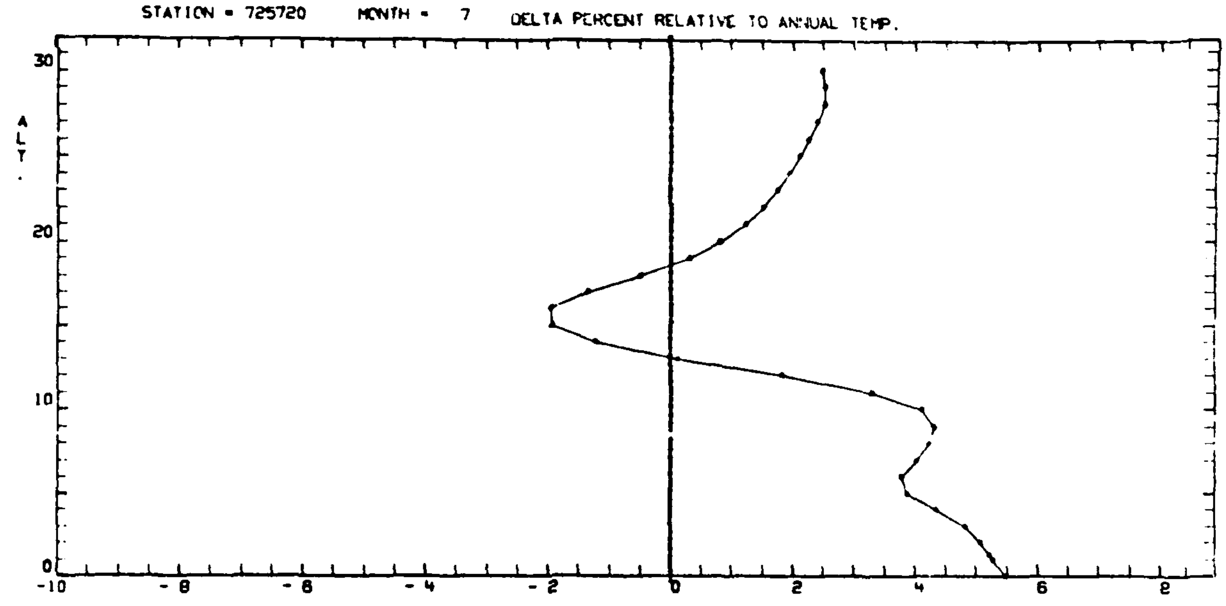

STATION = 725720 MONTH = 7 DELTA PERCENT RELATIVE TO ANNUAL TEMP.
ALT.
0
10
20
30
-10
-8
-6
-4
-2
0
2
4
6
8

Fig. B-7

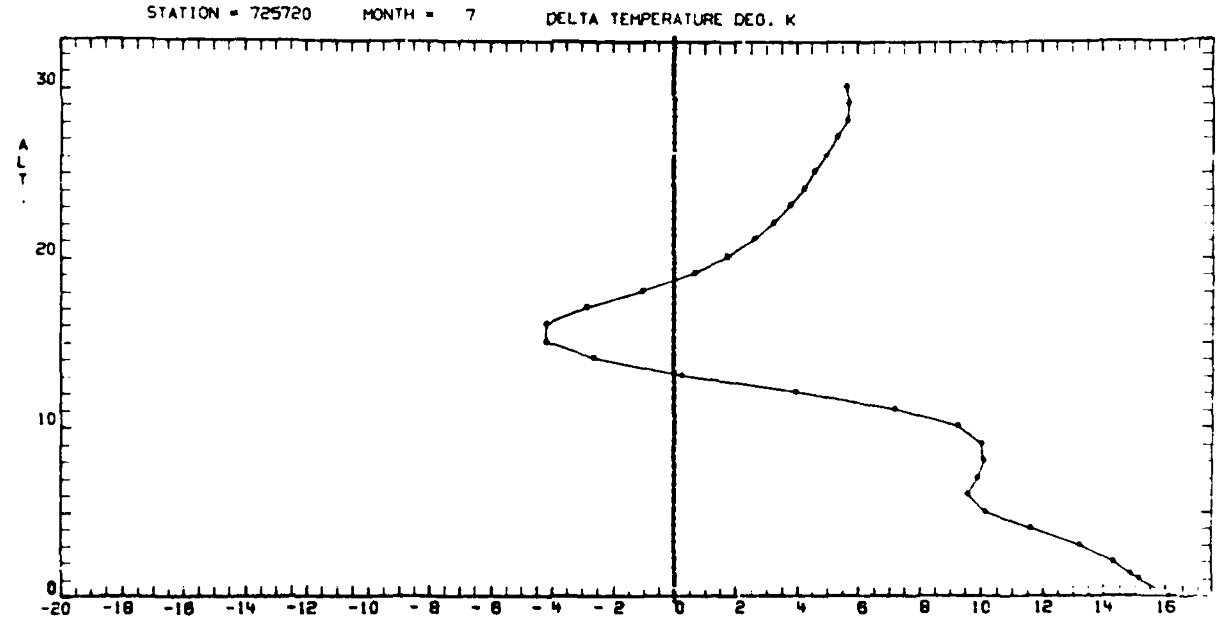

STATION = 725720 MONTH = 7 DELTA TEMPERATURE DEG. K
ALT.
0
10
20
30
-20
-18
-16
-14
-12
-10
-8
-6
-4
-2
0
2
4
6
8
10
12
14
16

Fig. B-8

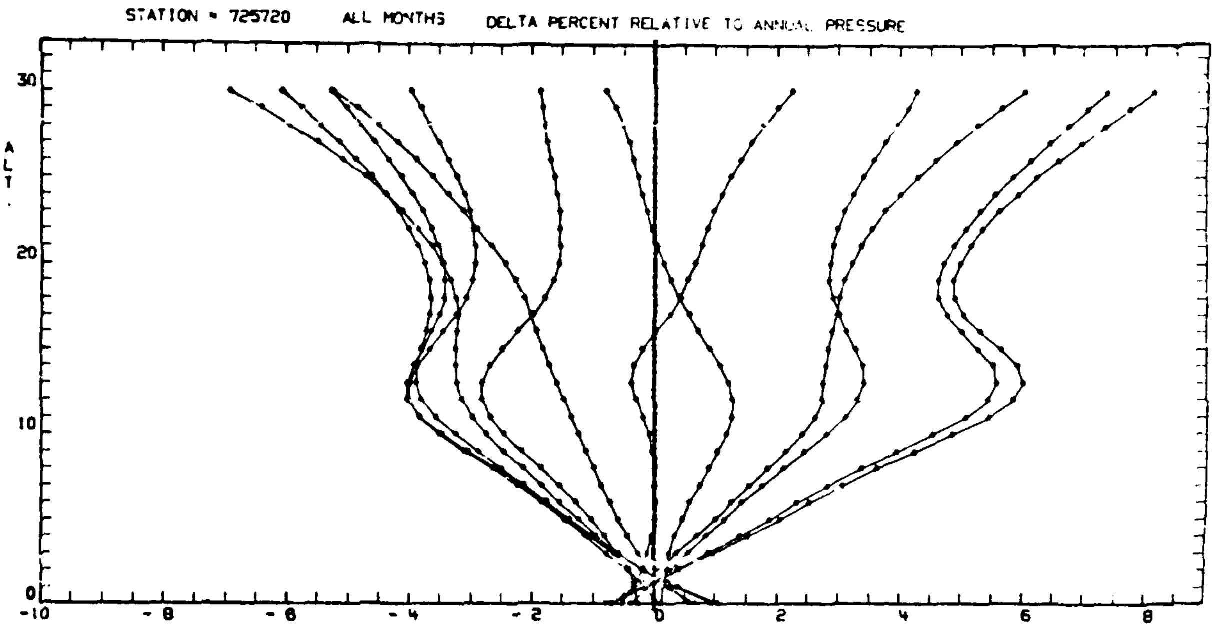


Fig. B-9

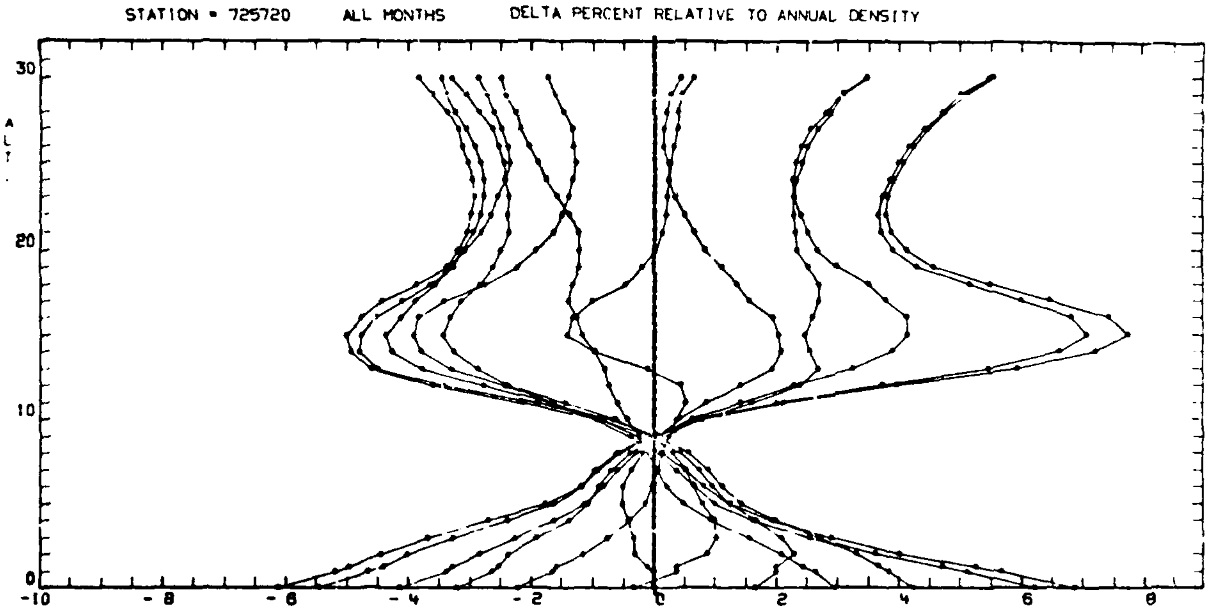


Fig. B-10

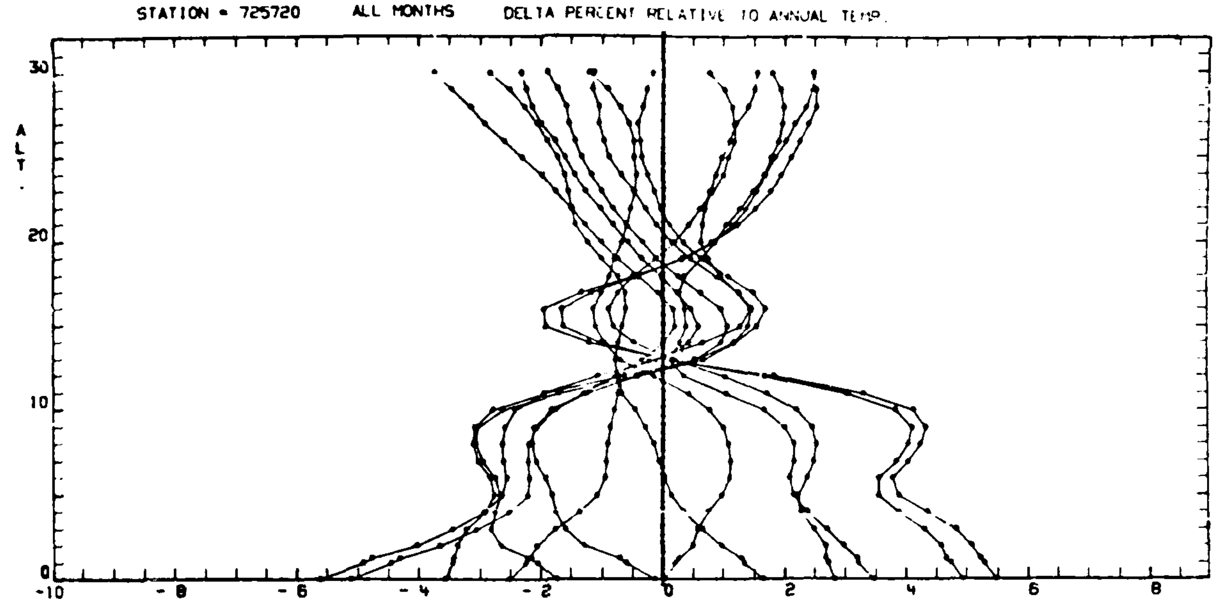


Fig. B-11

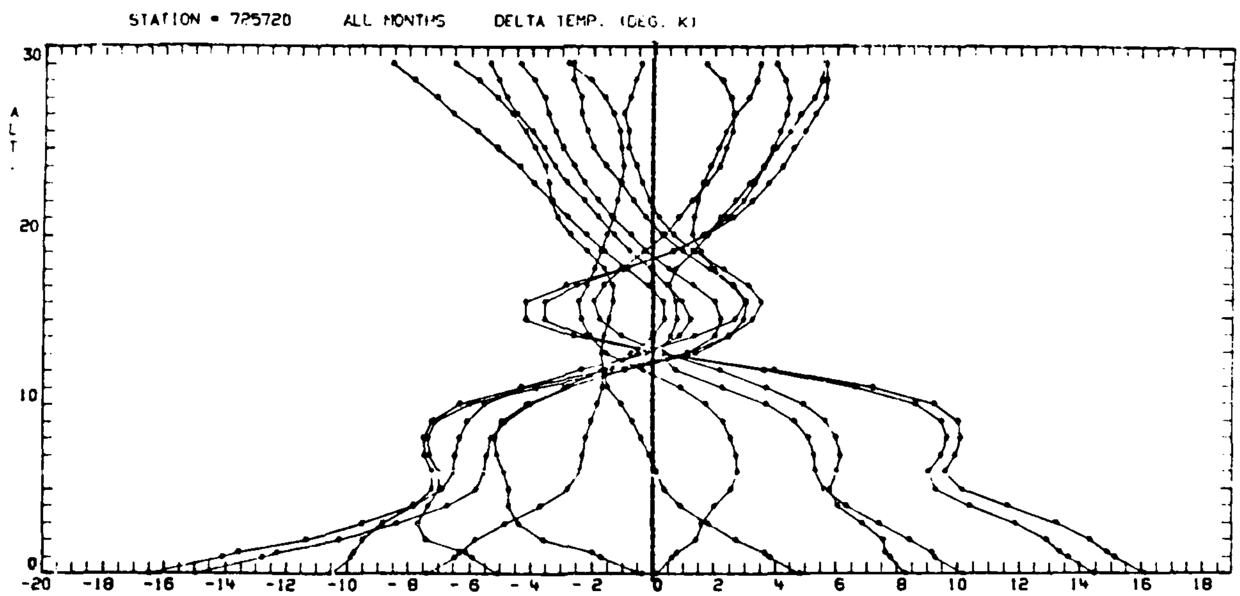


Fig. B-12

TABLE B-4

STATION 725720 MONTH 1

LEVEL	CVP	CVD	CVT	R(P,T)	R(P,D)	R(T,D)	DCVP	DCVD	DCVT
.000	.0110	.0461	.0361	-.8720	.9234	-.9931	-.0712	-.0011	-.0210
1.000	.0087	.0313	.0260	-.5081	.6984	-.9713	-.0487	-.0034	-.0140
1.288	.0084	.0280	.0239	-.3648	.8094	-.9605	-.0435	-.0042	-.0125
2.000	.0082	.0230	.0221	.0725	.2850	-.9350	-.0369	-.0073	-.0091
3.000	.0092	.0199	.0234	.5527	-.1901	-.9233	-.0341	-.0127	-.0056
4.000	.0115	.0162	.0238	.7975	-.4632	-.9041	-.0285	-.0190	-.0039
5.000	.0143	.0138	.0246	.8805	-.5341	-.8710	-.0241	-.0251	-.0035
6.000	.0173	.0117	.0252	.9163	-.5019	-.8064	-.0197	-.0308	-.0037
7.000	.0203	.0102	.0252	.9216	-.2866	-.6360	-.0151	-.0353	-.0053
8.000	.0236	.0105	.0235	.9005	.2339	-.2122	-.0104	-.0366	-.0105
9.000	.0263	.0159	.0197	.7966	.6640	.0770	-.0094	-.0300	-.0225
10.000	.0270	.0255	.0171	.3654	.9031	.2102	-.0157	-.0185	-.0373
11.000	.0279	.0395	.0220	-.2441	.8415	-.7293	-.0336	-.0104	-.0454
12.000	.0263	.0481	.0286	-.5308	.8633	-.8850	-.0504	-.0069	-.0457
13.000	.0240	.0443	.0262	-.5563	.8710	-.8928	-.0464	-.0059	-.0421
14.000	.0222	.0367	.0206	-.4760	.8701	-.8476	-.0352	-.0060	-.0383
15.000	.0208	.0352	.0201	-.4863	.8608	-.8572	-.0346	-.0056	-.0353
16.000	.0191	.0346	.0213	-.4628	.8379	-.8717	-.0368	-.0058	-.0324
17.000	.0177	.0321	.0211	-.3660	.7910	-.8589	-.0356	-.0057	-.0287
18.000	.0169	.0277	.0192	-.1682	.7280	-.7982	-.0300	-.0065	-.0253
19.000	.0168	.0238	.0178	.0544	.6653	-.7093	-.0248	-.0108	-.0228
20.000	.0172	.0211	.0172	.2461	.6136	-.6143	-.0211	-.0133	-.0211
21.000	.0180	.0190	.0170	.4128	.5767	-.5060	-.0180	-.0160	-.0193
22.000	.0191	.0179	.0176	.5273	.5472	-.4225	-.0164	-.0188	-.0194
23.000	.0205	.0179	.0182	.5780	.5577	-.3550	-.0156	-.0208	-.0202
24.000	.0219	.0187	.0184	.5818	.5977	-.3044	-.0152	-.0216	-.0221
25.000	.0234	.0197	.0185	.5806	.6452	-.2475	-.0147	-.0222	-.0246
26.000	.0249	.0215	.0188	.5477	.6817	-.2388	-.0153	-.0222	-.0275
27.000	.0262	.0233	.0194	.5144	.6973	-.2559	-.0165	-.0224	-.0300
28.000	.0274	.0249	.0204	.4899	.6987	-.2814	-.0179	-.0229	-.0318
29.000	.0281	.0269	.0206	.4208	.7215	-.3246	-.0194	-.0217	-.0345
30.000	.0303	.0303	.0209	.3478	.7617	-.3405	-.0209	-.0210	-.0383

TABLE B-5

STATION 725720 MONTH 7

LEVEL	CVP	CVD	CVT	R(P,T)	R(P,D)	R(T,D)	DCVP	DCVD	DCVT
.000	.0064	.0472	.0412	-.9256	.9439	-.9987	-.0821	-.0004	-.0124
1.000	.0036	.0308	.0288	-.5101	.5930	-.9951	-.0560	-.0016	-.0053
1.288	.0032	.0267	.0256	-.2633	.3732	-.9933	-.0491	-.0022	-.0042
2.000	.0031	.0117	.0115	.0755	.1938	-.9636	-.0201	-.0029	-.0033
3.000	.0035	.0088	.0097	.4306	-.0781	-.9334	-.0150	-.0044	-.0026
4.000	.0041	.0066	.0083	.6306	-.1724	-.8732	-.0108	-.0059	-.0024
5 000	.0048	.0054	.0078	.7346	-.1785	-.7997	-.0084	-.0072	-.0024
6.000	.0056	.0064	.0088	.6848	-.0637	-.7708	-.0095	-.0080	-.0032
7.000	.0065	.0067	.0098	.7297	-.0976	-.7518	-.0100	-.0095	-.0034
8.000	.0075	.0068	.0107	.7719	-.1146	-.7201	-.0101	-.0113	-.0035
9.000	.0087	.0069	.0117	.8110	-.1103	-.6713	-.0098	[illegible]	[illegible]
10.000	.0101	.0071	.0124	.8197	-.0054	-.5773	-.0094	-.0155	-.0048
11.000	.0115	.0082	.0119	.7541	.3075	-.3930	-.0086	-.0152	-.0078
12.000	0123	.0119	.0108	.4806	.5998	-.4135	-.0104	-.0113	-.0134
13.000	.0129	.0177	.0114	-.0645	.7665	-.6904	-.0163	-.0065	-.0193
14.000	.0124	.0218	.0137	-.3948	.8166	-.8528	-.0231	-.0043	[illegible]
15.000	.0113	.0231	.0157	-.4439	.7911	-.8993	-.0275	-.0039	-.0186
16.000	.0104	.0210	.0150	-.3506	.7456	-.8855	-.0255	-.0044	-.0165
17.000	.0096	.0165	.0120	-.1561	.6945	-.8 91	-.0190	-.0051	-.0141
18.000	.0095	.0139	.0101	-.0072	.6906	-.7282	-.0145	-.0057	-.0134
19.000	.0096	.0123	.0085	.0736	.7252	- 6334	-.0113	-.0057	-.0134
20.000	.0097	.0109	.0074	.2055	.7497	-.4936	-.0086	-.0051	-.0132
21.000	.0099	.0104	.0066	.2642	.7867	-.3875	-.0071	-.0062	-.0137
22.000	.0102	.0098	.0060	.3491	.8226	-.2457	-.0056	-.0063	-.0140
23.000	.0104	.0097	.0060	.4008	.8219	-.1924	-.0054	-.0067	-.0141
24 000	.0109	.0096	.0060	.4670	.8348	-.0971	-.0048	-.0072	-.0145
25.000	.0112	.0097	.0061	.5018	.8429	-.0424	-.0045	-.0076	-.0149
26.000	.0116	.0099	.0062	.5110	.8424	-.0328	-.0046	-.0079	-.0153
27.000	.0119	.0105	.0071	.4820	.8072	-.1282	-.0057	-.0084	-.0152
28.000	.0120	.0100	.0071	.5535	.8025	-.0528	-.0052	-.0091	-.0149
29.000	.0125	.0103	.0080	.5754	.7723	-.0751	-.0057	-.0102	-.0149
30.000	.0133	.0109	[illegible]	.5900	[illegible]	[illegible]	[illegible]	[illegible]	-.0157

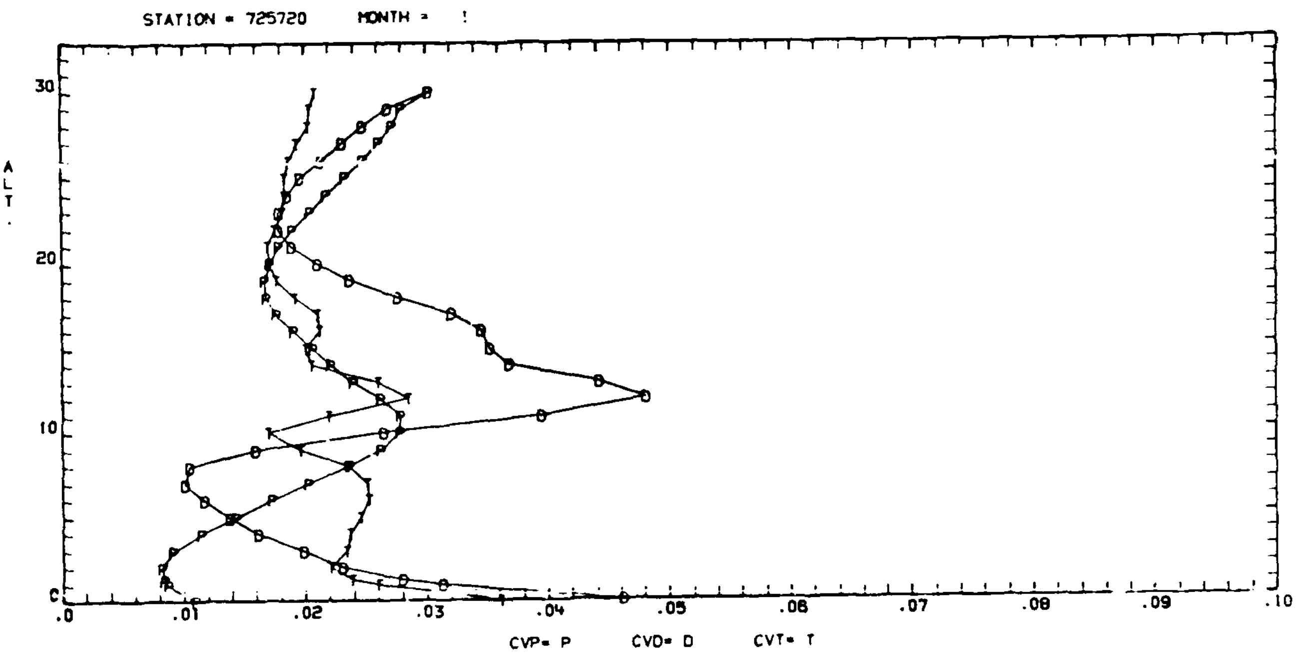


Fig. B-13

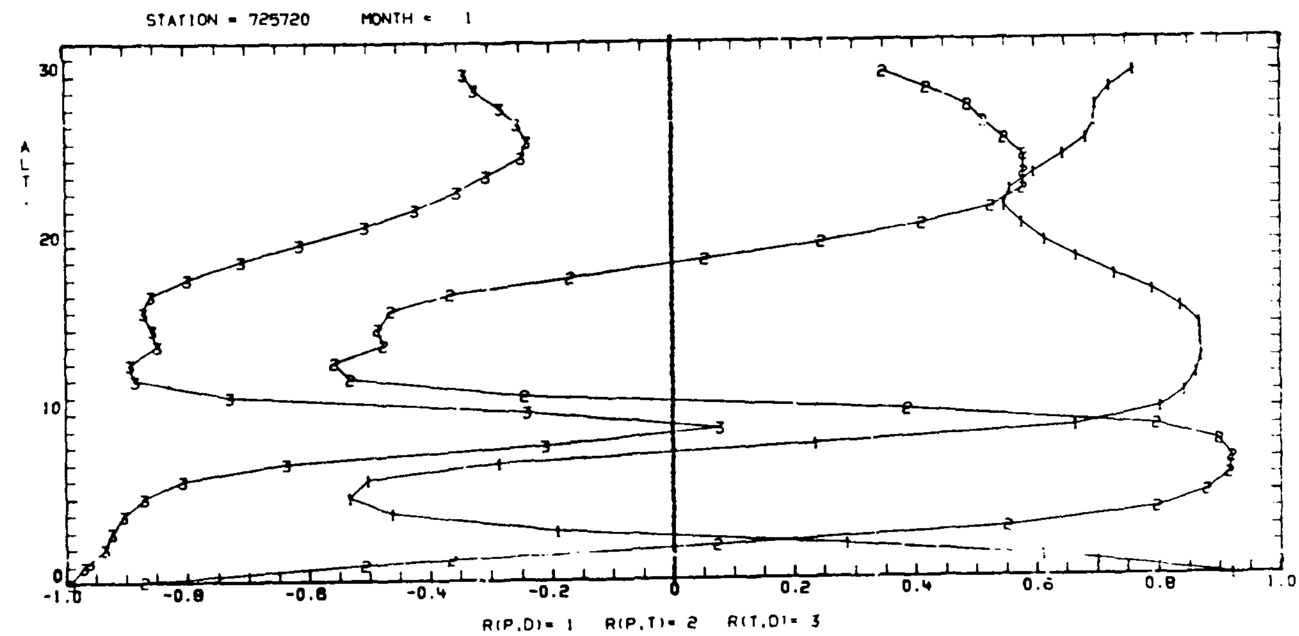


Fig. B-14

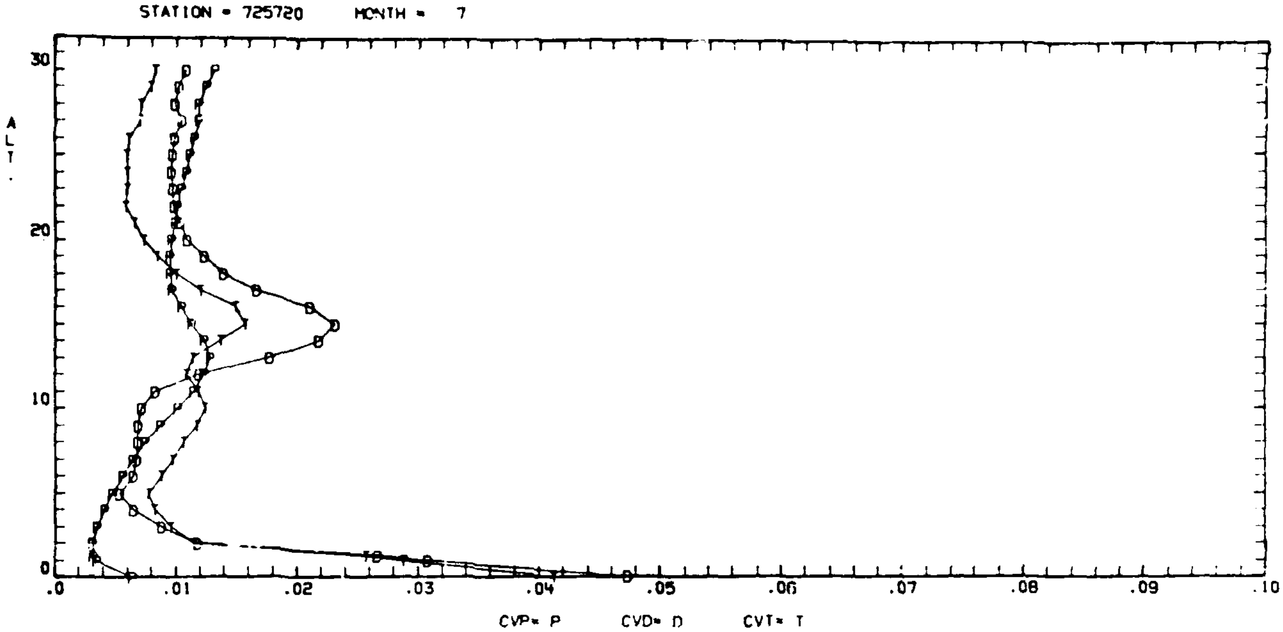


Fig. B-15

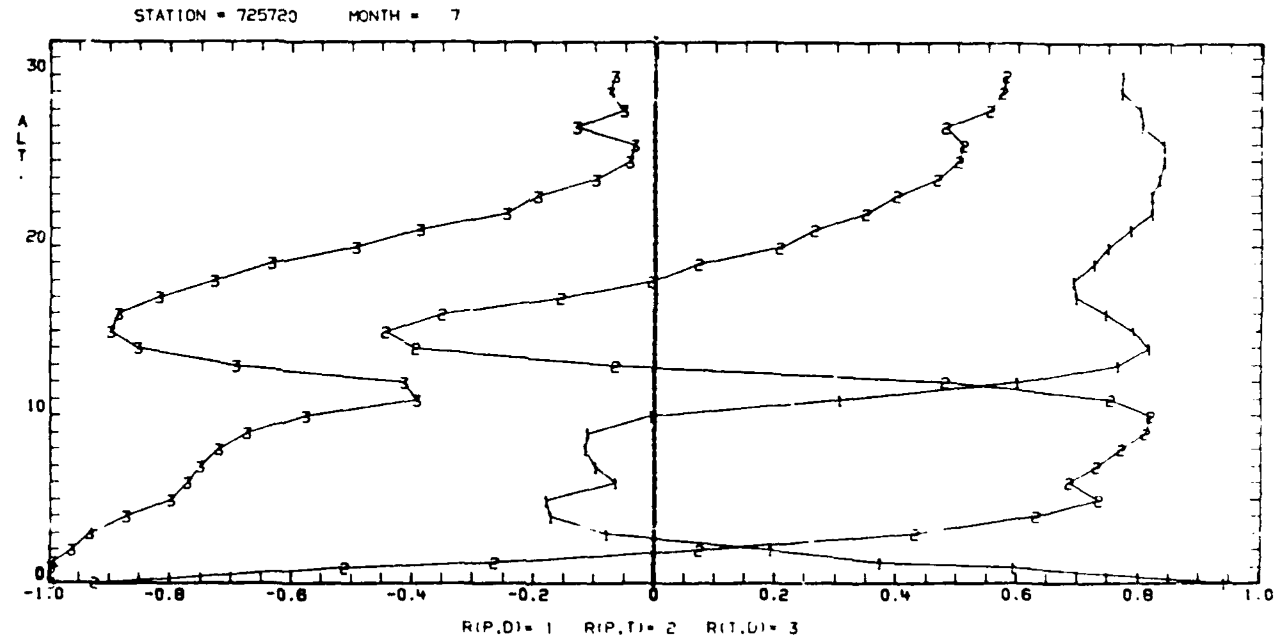


Fig. B-16

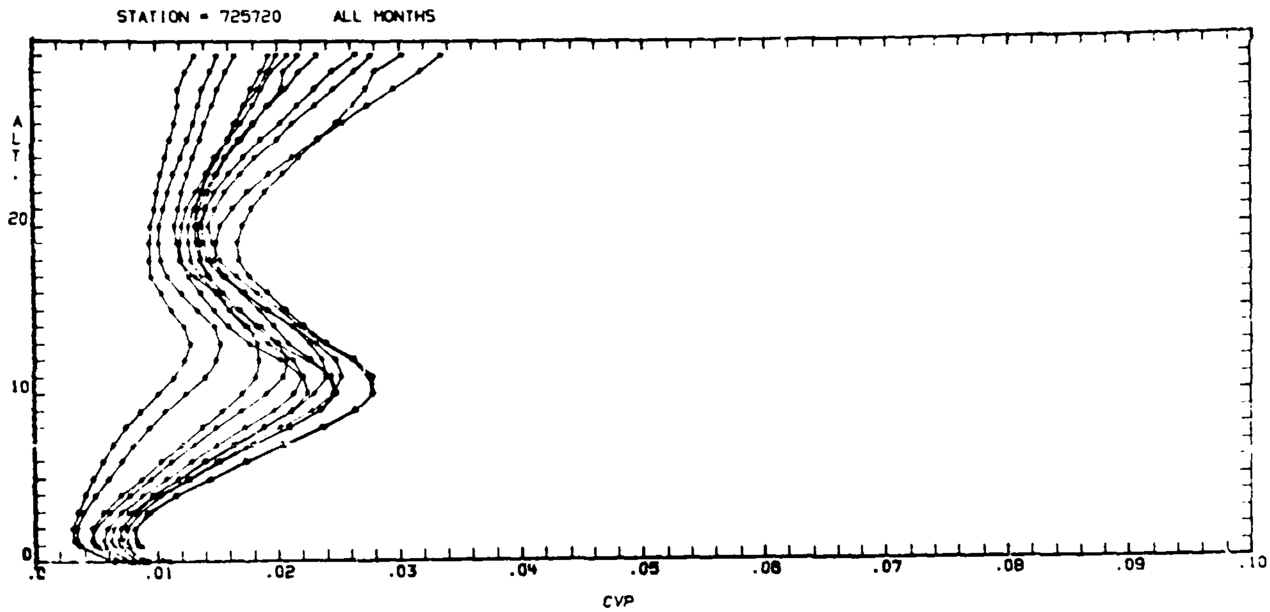


Fig. B-17

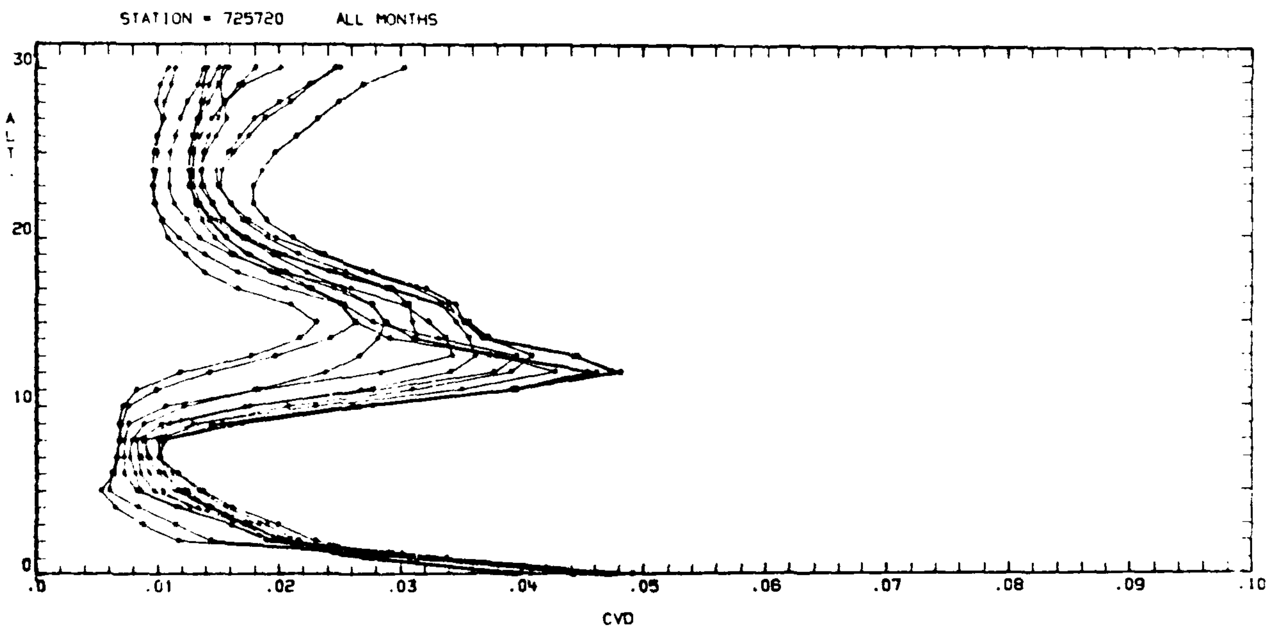


Fig. B-18

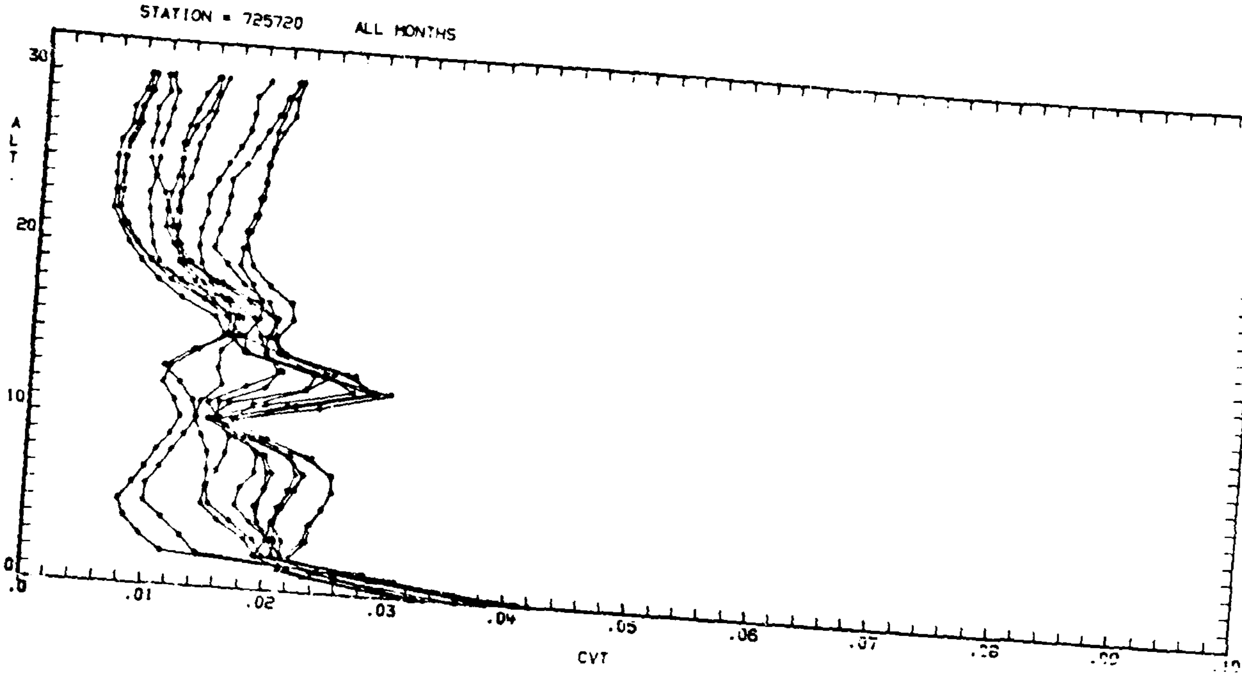


Fig. B-19

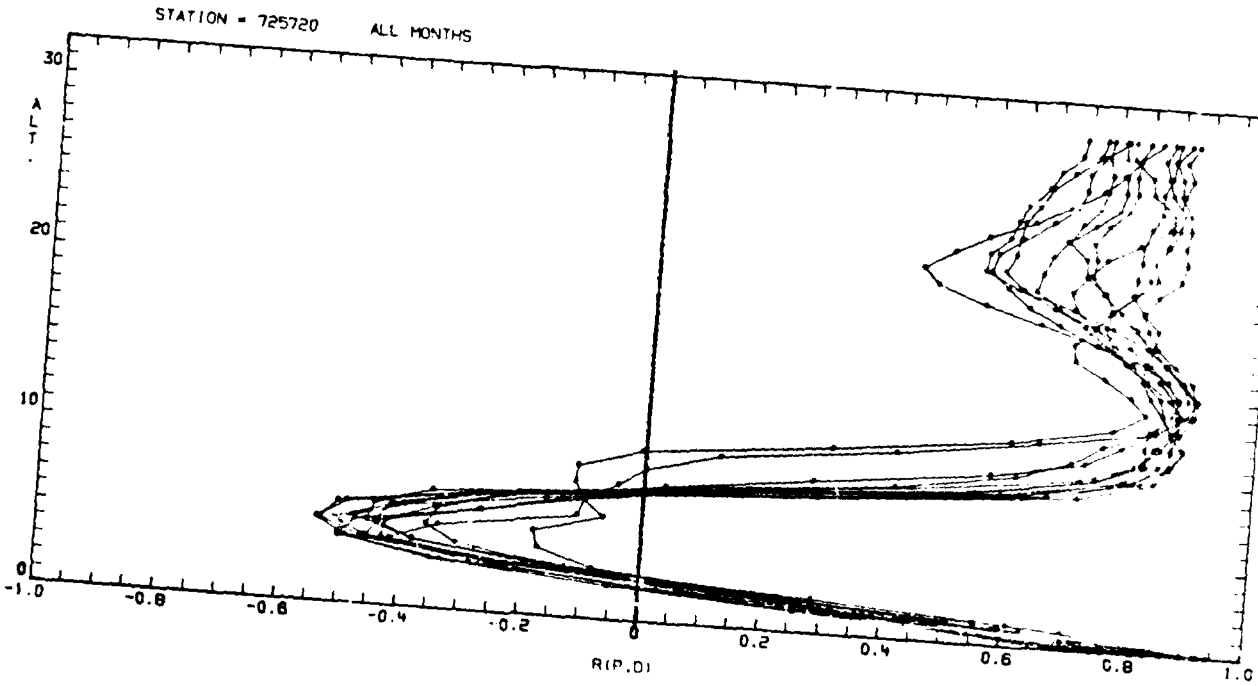


Fig. B-20

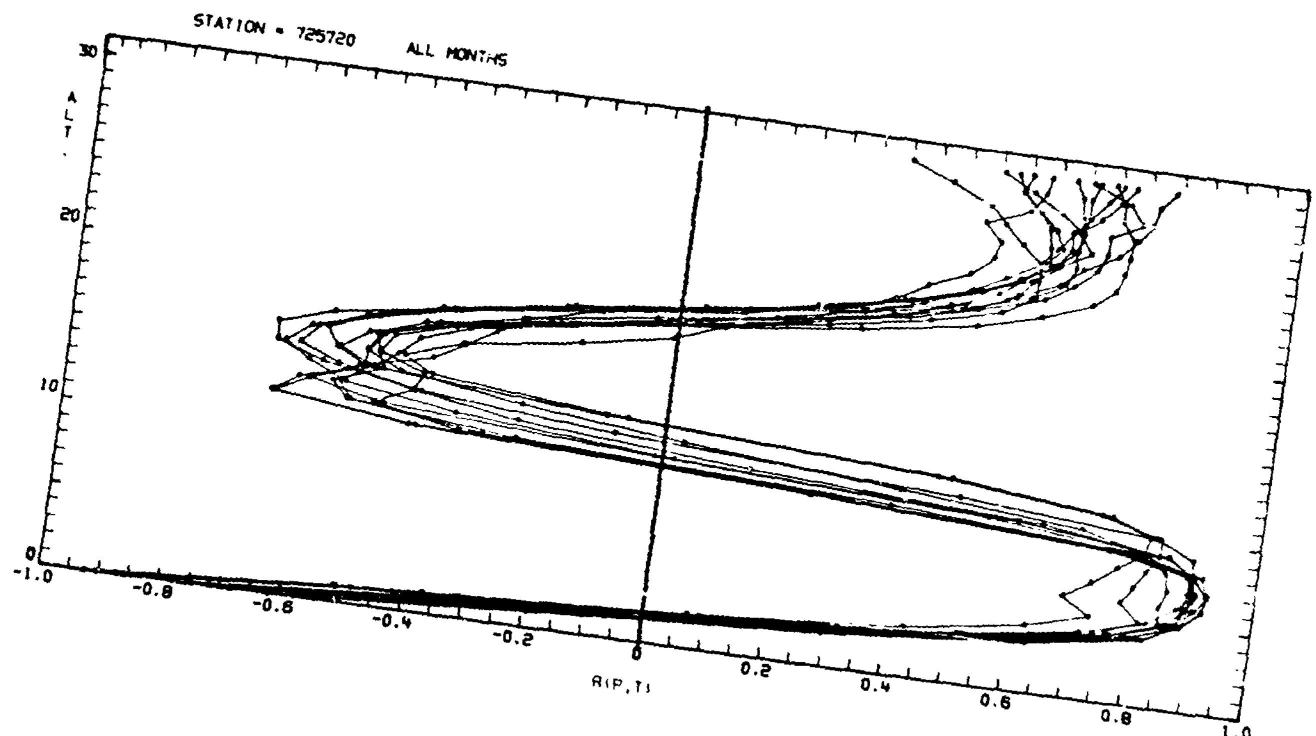


Fig. B-21

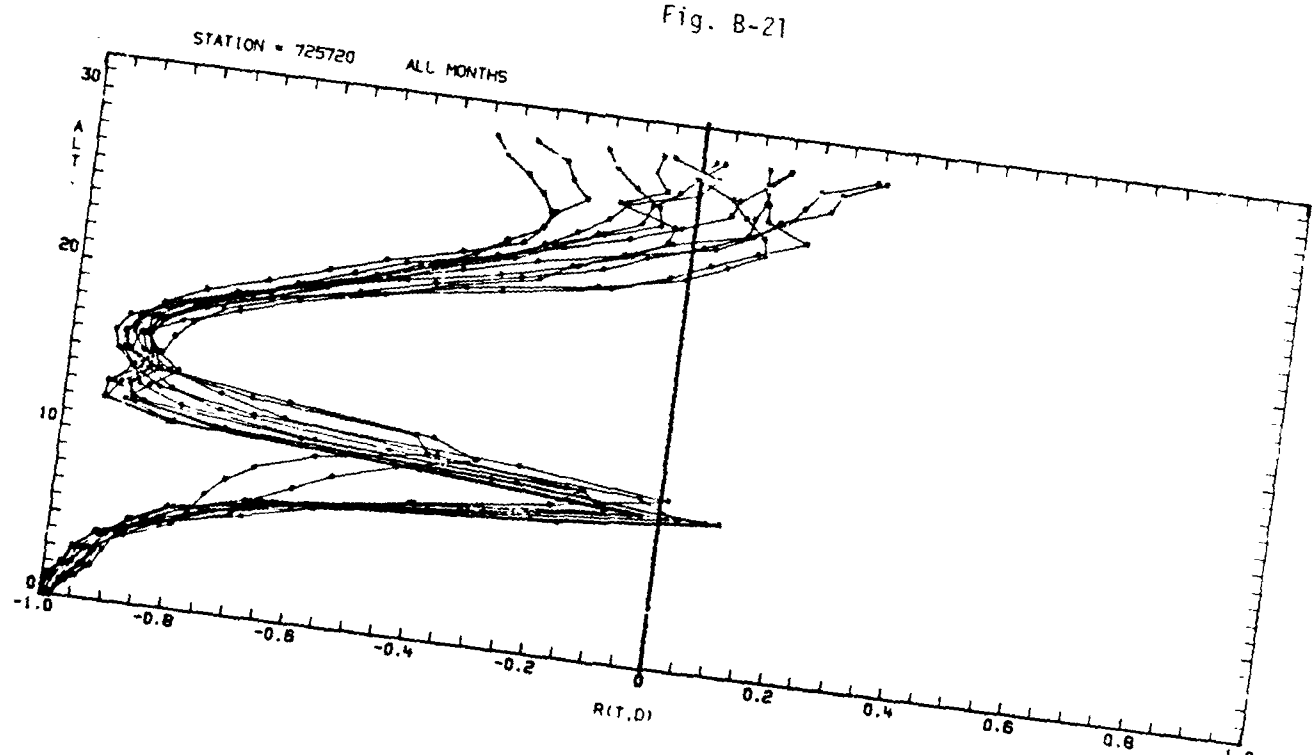


Fig. B-22